# Natural Resources of . . .

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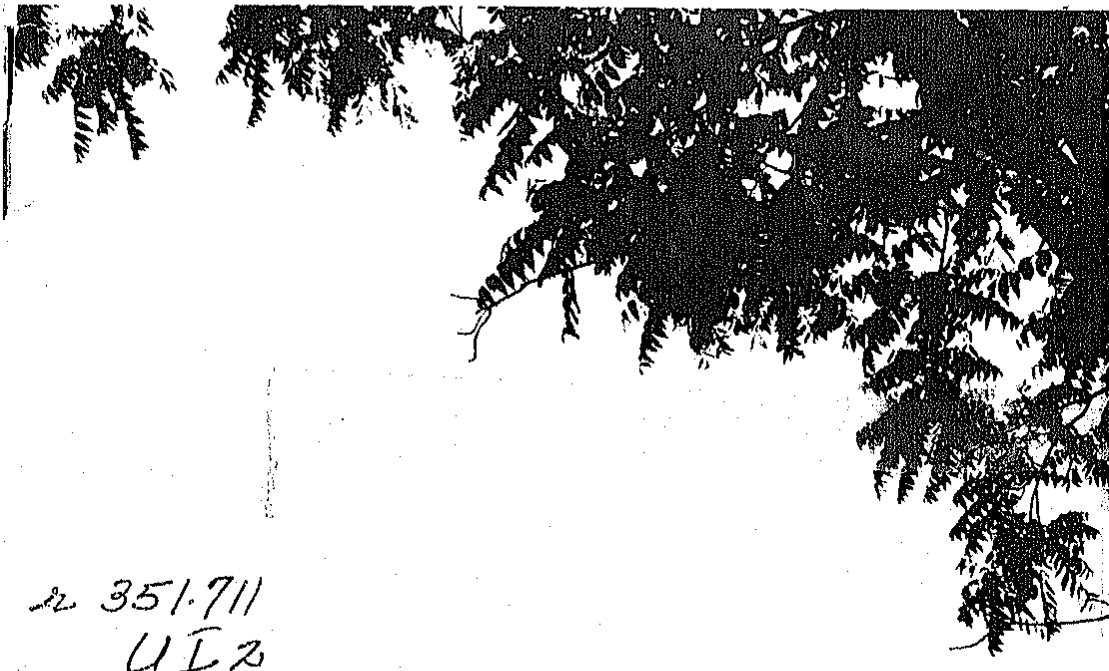

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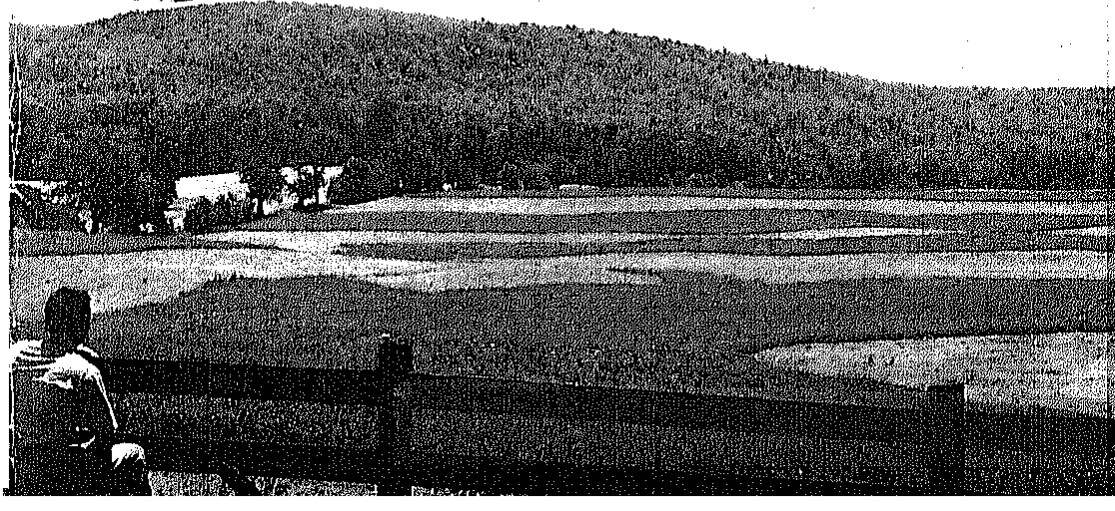

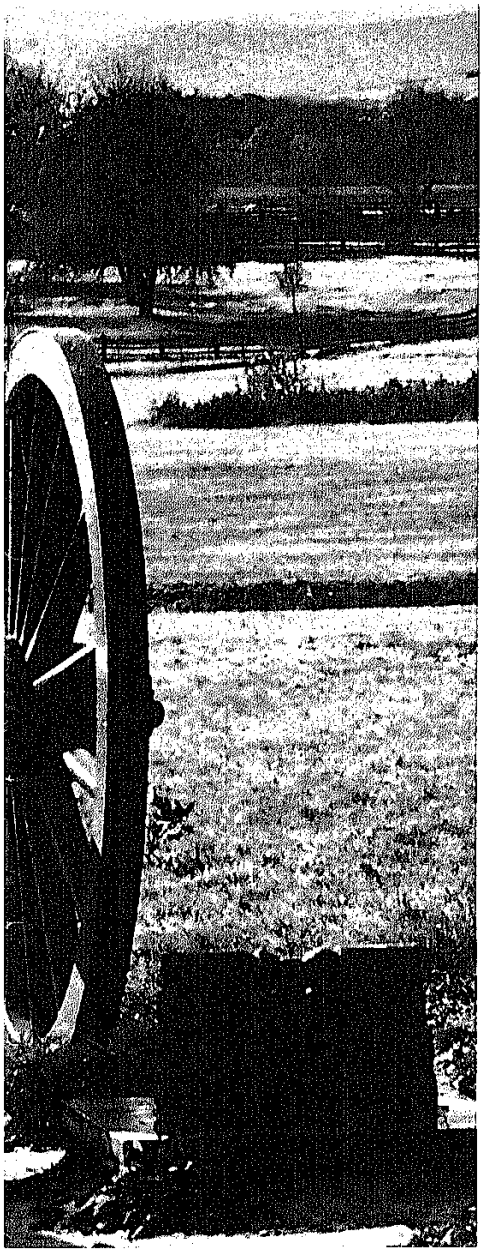

The purpose of this booklet is to bring a new awareness on the part of the American people of our rich natural resource heritage, its history, its present, and its future. To know out land is to love it and cherish it and protect it from the ravages both of nature and man.

Stewart L. Udall

Secretary of the Interior.

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William Penn's equitable dealings with the Indians have been memorialized in this painting by Benjamin West. Penn is shown treating with the Delaware at Shackamaxon in 1682.

# Introduction

Pennsylvania's central location among the 13 original States is usually cited as the reason for its nickname, "the Keystone State." In the long history of the Republic, however, Pennsylvania has served as a spiritual and material keystone in many ways.

For example, the Pennsylvania colonists' early practice of religious toleration and freedom of worship helped provide a foundation for national adoption of these ideals. Likewise, the elimination of human slavery in America may be traced in large part to the hostility of Pennsylvanians to this institution.

Agriculturally, Pennsylvania was "the Nation's breadbasket" until the settlement and cultivation of the Great Plains, a westward movement that was carried out with the help of a Pennsylvania invention—the famous Conestoga wagon. Industrially, the State's resources of coal, iron, and oil formed the keystone that supported America's rise as a great manufacturing nation and world power in the 19th and 20th centuries.

In these and many other ways, the Commonwealth has been an important source of American tradition, history, wealth, and power. Of no other State can it be said with such justice that "its story is the biography of a Nation."

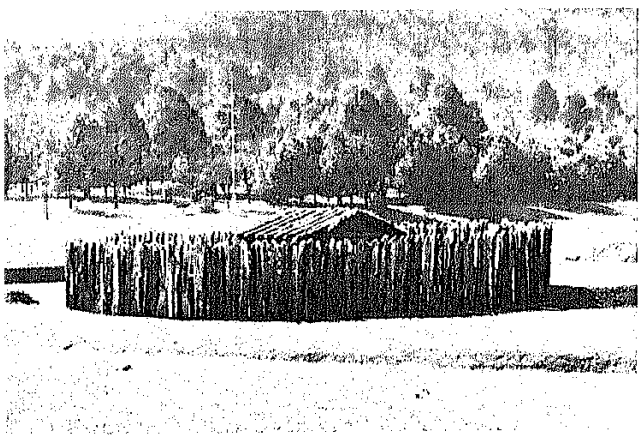
*Early History*

For those who came to America early in the 17th century, rivers were the only highways leading into the continent from the lowlands

of the Atlantic coast. Thus it was that Europeans first entered Pennsylvania from the south, along the valleys of the Delaware and Susquehanna Rivers. Capt. John Smith may have been the first European to follow this route when, in 1608, he explored the head of the Chesapeake Bay as far as "the countrey of the Susquehannocks."

If he actually entered the territory now called Pennsylvania, however, Captain Smith did not stay long, nor did the first of those who followed him. Henry Hudson, Capt. Samuel Argall, and other explorers sailed up the rivers into Pennsylvania, but the first settlements in the region were established further south, many years later, in the areas known today as Delaware and New Jersey.

These settlements were built by two commercial rivals, the Swedes and the Dutch, and the first permanent extension of Europeans into Pennsylvania was a reflection of their rivalry. In 1643 a band of settlers from New Sweden (in Delaware) pushed up the river to found a small village on Tinicum Island, near present-day Chester. This and other signs of growth and vigor on the part of New Sweden did not please the Dutch, who made their headquarters at New Amsterdam, on Manhattan Island. From New Amsterdam, the Dutch sent expeditions south along the coast and into the Delaware Bay to construct forts that would control traffic along the Delaware River.



The first major battle of George Washington's military career was fought at Fort Necessity on July 3, 1754.

The Swedish settlers countered with forts of their own. Finally, in 1655, the struggle for this territory appeared to be resolved by a strong Dutch force that sailed up the Delaware and took possession of New Sweden entirely, including the small part that lay in Pennsylvania.

As it turned out, however, the Dutch were only clearing the ground for the more powerful English. In 1664 settlers from that nation took over New Netherland, falling heir to New Sweden and the small Pennsylvania community on Tinicum Island. Treaties secured the English claim, and the Duke of York established his rule over the area in the name of the recently restored King Charles II.

### *The Era of William Penn*

King Charles, in his years of exile under the English Puritans, had incurred a debt of 16,000 pounds to a gentleman named Sir William Penn. This debt was inherited by William's son and namesake, a prominent convert to the Quaker faith. The younger Penn, in spite of his religious nonconformity, was close to the English King, and persuaded him to make repayment in the form of land in the New World. Penn's desire was to establish a refuge from religious intolerance that had plagued England with conflict and bloodshed during most of the century.

In 1681 Penn obtained from the King a grant to almost all the land that is now Pennsylvania, and he began to set up his "holy experiment." As a political and social thinker, Governor Penn was far in advance of his time, and his views are especially well characterized by two of the measures he took in establishing the colony. One of these was to include, in the colony's "Frame of Government," the first clause ever inserted in a written constitution to provide for constitutional amendments. The second measure was his scrupulous concern with buying up Indian claims before selling or settling the land. Not until this policy was rashly abandoned by his successors in the 18th century did Pennsylvania need frontier defences against Indians.

Such enlightened leadership, coupled with Penn's international prestige as an articulate Quaker spokesman, drew shiploads of colonists

from Europe. By 1685, in addition to 15,000 Indian inhabitants, Pennsylvania had over 7,000 settlers, and the capital city of Philadelphia boasted 2,500 souls.

*The Colonial Period*

During the first quarter of the 18th century, English and Welsh Quakers were preponderant among immigrants to Pennsylvania, although the German religious minorities now called "Pennsylvania Dutch" also arrived during this period. Later there was a large influx of Scotch-Irish, a hardy people who naturally gravitated to the frontier regions. In spite of the diverse interests and temperaments of these groups, however, they soon learned how to live together in relative harmony, settling their differences through vigorous political action instead of armed conflict. This was possible because Pennsylvania had the most powerful elected assembly of all the colonies, thanks to William Penn's enlightened rule.

Unfortunately, Penn's successors in the office of Governor did not live up to his standards of fair play in dealing with the Indians. When the swelling population of the colony made the acquisition of more land necessary, the Indians were antagonized because a technicality in an earlier purchase agreement was used to defraud them of land rightfully theirs. Penn had originally agreed to buy from the Indians a tract extending as far west as a man could walk in 3 days. He himself had walked out a day and a half of the tract to mark off as much land as he felt was then needed. In 1737 the Governor hired three men to walk out the remaining day-and-a-half, going as fast as they could to cover the maximum possible distance. This infamous "Walking Purchase" broke the bonds of friendship Penn had forged, helping to turn the Indians against the settlers at the worst possible time. For just then the westward movement of the colonists was bringing them into conflict with the French.

Control of the Ohio River Valley was the major issue. The Ohio originates in western Pennsylvania (at the confluence of the Allegheny and Monongahela Rivers) and to French traders

The Thompson-Neely House, now part of a State park, was used as headquarters for American officers in 1776.

the valley was an important link between their colonies of Canada and Louisiana. But the English claimed the area, and when the English settlers began a major effort to exploit it, the French acted. In a move reminiscent of the old Delaware River conflict between the Dutch and the Swedes, the French in 1753 began building forts along the Ohio to control navigation.

When this news reached Philadelphia, a hasty and unsuccessful effort was made to secure the allegiance of the western Indian tribes. Then the Governor of Virginia (which at that time lay claim to parts of western Pennsylvania) sent George Washington to the Forks of the Ohio to sound out the French, and Washington returned with news that the French intended to take possession of the Ohio. On April 17, 1754, the French made good their threat by attacking an unfinished Colonial fort at the Forks. Completing it themselves, they named it Fort Duquesne, and the French and Indian War was underway.

The first real battle of the war was a victory by George Washington over a small enemy force in western Pennsylvania, but only a few months later Washington had to surrender the hastily constructed Fort Necessity when his troops ran low on food and munitions. With most of the Indian tribes against them, the Colonials' chances were poor. Yet at this point, short-sighted Pennsylvania officials chose to alienate a powerful alliance of neutral Indian tribes, the Iroquois Confederacy. Officials tricked the

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Indians into signing away a vast tract of their land. The Iroquois, understandably angered, went over to the side of their traditional enemies, the French. In 1755 a combined force of French and Indians smashed General Braddock's army on the banks of the Monongahela, exposing settlements in the foothills of the Blue Mountains to murderous Indian raids.

In desperation, the Colonials moved to mend the breach with the Indians, and in 1756 a Grand Council was held at the Forks of the Delaware River in Easton, Pa. Following three more such councils the Indians agreed to abandon the French, and when a force of 5,000 Colonials marched to Fort Duquesne in 1758, they found the French had blown it up. By the end of the following year the French had been driven out of Pennsylvania, and Fort Duquesne had been rebuilt as Fort Pitt.

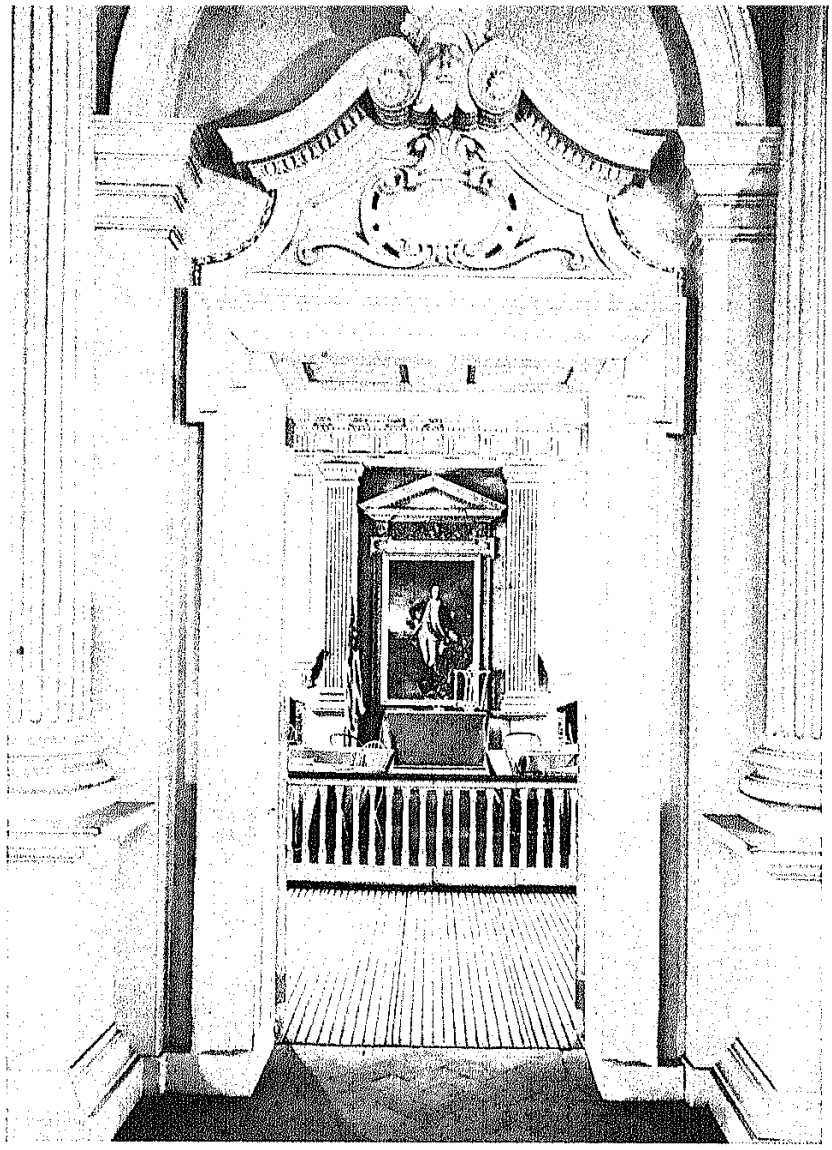
Conflict with the Indians continued long after the war itself was over, however. The great Indian leader, Pontiac, tried to unite all the tribes to push the Europeans back, and his warriors were defeated in 1763 at Bushy Run, near Fort Pitt. Sporadic fighting, including bloody massacres on both sides, did not end until the Fort Stanwix Treaty of 1768; not until then did colonization of western Pennsylvania begin again.

### *The Revolution in Pennsylvania*

During the middle years of the 18th century, when antagonism toward English colonial policies was building up in America, a local Pennsylvania political movement was helping to set the scene for Revolution. This was strange, in a way, for the movement was led by the pacifist Quakers. Called the Anti-Proprietary Party, it successfully opposed the Governors and upheld the political rights of the common citizen against the claims of those who held large land grants from the Crown. The egalitarian spirit fostered by this party was to become a major force behind the Revolution, and the party was to furnish a major Revolutionary leader in Benjamin Franklin.

Popular sentiment against the Stamp Act and other English revenue measures was strong in Pennsylvania, and in 1768 the assembly proclaimed its belief in "no taxation without representation." The meeting of the First and Second Continental Congresses in Philadelphia lent prestige to the idea of revolution against the Crown, and in 1775 the Pennsylvania delegation to the Second Congress voted by a narrow margin to adopt the Declaration of Independence. The influence of Benjamin Franklin was important in swaying the delegation, he became president of the new provincial convention which replaced the old assembly.

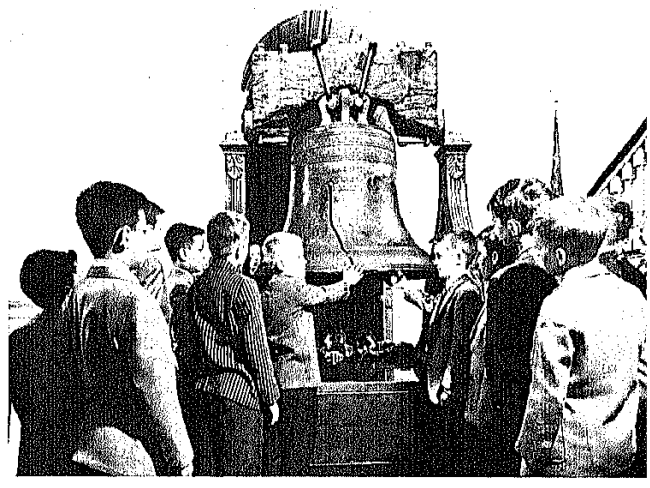
As a theater of war, Pennsylvania was chiefly characterized by the struggle for possession of Philadelphia, the largest and richest colonial city. The first attempt by the British to take the colonial capital was thwarted by Washington in the winter of 1776 when he defeated the enemy at Trenton and Princeton. But the following year General Howe, switching to the traditional southern water route into Pennsylvania, brought his army up the Chesapeake Bay and defeated Washington at the Battle of Brandywine. Philadelphia fell in September, and the Congress fled first to Lancaster, then



(Above) The Second Continental Congress met in Independence Hall and adopted the Declaration.

(Left) Col. Edwin L. Drake supervised as America's first oil well was "brought in" near Titusville in 1859.

(Right) Seeing the Liberty Bell, symbollic of our forefather's struggle for freedom, is a lesson in history.



to York. Washington went into winter quarters at Valley Forge, and the outlook seemed bleak for the Colonials.

Howe's preoccupation with Philadelphia proved to be a mistake, however. His forces were missed in the north, where the British suffered several important defeats. Then, in 1778, the most devastating blow of all was inflicted on them when Benjamin Franklin successfully concluded an alliance with France. Faced with the possibility of French intervention, Howe chose to coosolidate his forces, abandoning Philadelphia without a fight. The tide had turned permanently against the British, and the fighting ended with their surrender at Yorktown in 1781.

*From Colony to State*

After the Revolution, Pennsylvaoia settled longstanding boundary disputes with several surrounding States and assumed its present-day shape. Also settled was a dispute over enforcement of powers granted Congress in the new Constitution. Angered by a Federal tax on whiskey, settlers in western Pennsylvania rose in the famous Whiskey Rebellion. Suppression of the insurgents by President Washington demonstrated that the people were willing to support the new central government.

Under a liberalized new constitution patterned after the Federal model, Pennsylvania moved into an era of growth and expansion. By 1800 the Commonwealth had a population of over 600,000, much of it in new lands to the west of the Allegheny Mountains. This westward movement caused the shift of the State capital from Philadelphia to Lancaster in 1799, then to Harrisburg in 1812. It also helped spur the widespread construction of roads, bridges, and canals.

At this time, too, Pennsylvania began to assume the characteristics of a true industrial center. Although the State had always been a major supplier of iron products to the other Colonies, it did not systematically exploit its abundant deposits of coal and iron until the Industrial Revolution came to America. In the early 19th century Pittsburgh, on the site of Fort Pitt, became an important producer of iron and steel products, and in the eastern part of the State the Wyoming Valley anthracite deposits were opened up. The rise of the steam locomotive added a major new market for steel, and steelmakers in turn required more and more coal. In 1859 the State gave birth to a whole new industry when the world's first oil well was drilled near Titusville.

The period was not one of uninterrupted progress. The War of 1812 closed down the Natioo's biggest port, Philadelphia, causing great financial loss to the city and the State. A financial panic struck in 1837, and 4 years later the Commonwealth itself went bankrupt. But Pennsylvania was healthy enough to absorb these blows with little permanent damage.

*The Civil War and After*

The physical and moral strength of Pennsylvania was to prove a pillar of the Union in the approaching struggle over slavery. Pennsylvania Quakers had long opposed the "peculiar institution." Historians believe that the Underground Railroad, which helped so many slaves escape from the South, originated in Pennsylvania around the turn of the century. Citizens and even officials of the Commonwealth were prominent in hampering enforcement of the Fugitive Slave Act of 1793.

When secession of the Southern States came, Pennsylvania Gov. Andrew Curtin became one of the Union's leading governors, mobilizing his State without delay. A detachment of 530 Pennsylvania troops was the first to reach the threatened city of Washington and became known as the "First Defenders." Altogether, the Commonwealth supplied more men to the Union Army and Navy than any other State except New York, despite widespread opposition to the unpopular draft laws. From Pennsylvania farms and factories came a large share of the materials needed to support the war effort, and the most decisive battle of the war, Gettysburg, was fought on Pennsylvania soil.

The Pennsylvania industrial boom that followed the American Revolution was repeated, with greater intensity after the Civil War. It was based on the iron and steel producing industries, which Pittsburgh tycoons like Carnegie

It is hard to imagine the quiet Gettysburg countryside as the setting for the ugliness of a Civil War battle.

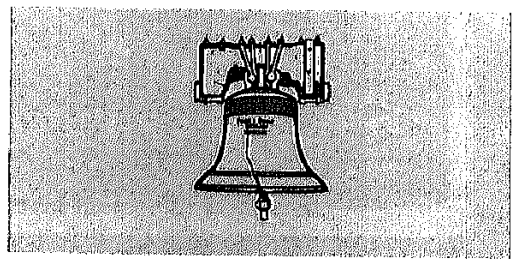
and Frick propelled to a position of international prominence. However, other Pennsylvania industries assumed national importance as well, including the manufacture of textiles and clothing, glass products, and paper. Production of minerals, especially iron and steel, increased rapidly to keep pace with the State's burgeoning industrial needs, and the Commonwealth made the shift from an agricultural to an industrial economy. For many years to come this economy was to be the mainstay of America's westward expansion, and ultimate growth into a world power.

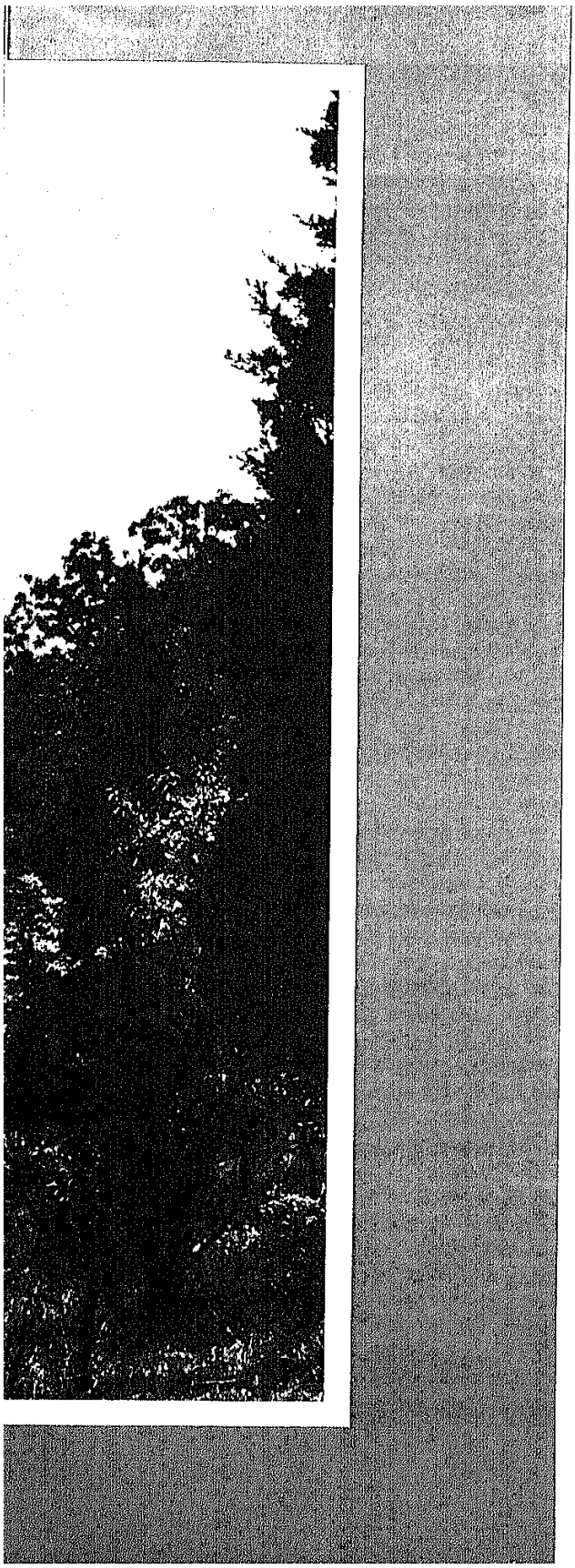
From 1865 to 1914 a new wave of European immigration swept Pennsylvania, helping supply the State's unprecedented demands for industrial labor. Workingmen grew more conscious than ever of their importance, and the Pennsylvania labor movements that had originated early in the 18th century took on new life and vigor. Both the Congress of Industrial Organizations and the American Federation of Labor had their origins in Pennslyvania during this period. A long struggle for union recognition began, and for many decades Pennsylvania endured labor-management conflicts that sometimes erupted into bloody violence. By the beginning of the 20th century, however, unions had won a wide measure of acceptance as a legitimate social force, and even began entering the State political arena on occasion.

### *Pennsylvania Today*

Modern Pennsylvania continues to be a keystone of national progress. The Commonwealth ranks first among the States in output of iron and steel, and third in overall production of minerals. Pennsylvania factories annually manufacture billions of dollars worth of such varied goods as electrical machinery, chemicals, pretzels, clothing, transportation equipment, tobacco products, and electronic circuitry. Not primarily an agricultural State, Pennsylvania nevertheless produces livestock and crops worth over three-quarters of a billion dollars annually and forest products valued at more than a billion dollars. Philadelphia is one of the country's main ports, as well as a major shipbuilding area. This heavy concentration of agriculture, industry, mining, and transportation has made the State a national financial and banking center.

Contrasting with this urban growth and industrial might is "the other Pennsylvania"—the land of mountain wilderness and trout streams, of forests and picturesque farms. Sometimes industrial Pennsylvania has encroached unwisely on this land, and the results have been unfortunate—poisoned streams, scarred landscapes. But Pennsylvanians have learned how to prevent these tragedies from happening again, and how to correct their consequences. For citizens of the Commonwealth have learned that their State is not a mere industrial giant, nor a pure natural paradise, but—like America itself—a lively combinatinn of both.





# Physical Characteristics

Pennsylvania is roughly rectangular in shape and its area of 45,333 square miles, ranks it 33d in size among the States. Situated astride the Appalachian Mountains, it has access to the Atlantic Ocean, the Great Lakes, and the Ohio River Valley.

Altitudes range from sea level in the Philadelphia area to 3,213 feet at the summit of Mt. Davis in Somerset County. Although there are lowlands near the Atlantic Ocean and the Great Lakes, most of the State's terrain is mountainous. Its mean altitude is about 1,100 feet.

Except for a narrow lowland in the northwest corner of Pennsylvania, the western and northern parts of the State are occupied by a plateau. The Appalachian Mountain Range, averaging about 70 miles in width, trends north and northeast across the central and east-central parts of the State. East and southeast of these mountains, low rolling hills and shallow valleys extend to the Philadelphia area. A narrow lowland in the southeasternmost part of the State is part of the Atlantic Coastal Plain, which fringes the Delaware River and Delaware Bay.

Three large river systems have played important roles in the development of natural resources, the growth of industry, and the political history of the State. The Delaware River and its two principal tributaries, the Lehigh and the Schuylkill, drain eastern Pennsylvania. The Susquehanna River and its principal tributary, the West Branch, drain most of central and northern Pennsylvania. The Allegheny and Monongahela Rivers, which merge to form the Ohio River at Pittsburgh, drain most of western Pennsylvania. From the early days of colonization until the advent of cars and highways, the navigability of the rivers and the good land transportation routes along the river valleys have influenced the

The mountains and valleys seen today in Pennsylvania were carved in the crucible of time.

development of mineral resources, the location of manufacturing complexes, and the distribution of population.

*Climate*

The mean annual temperature in Pennsylvania is about 50° F.; July's mean temperature is about 76° F. and January's is about 33° F. Eastern Pennsylvania, despite moderating effects of the ocean, has a range in temperature from considerably below zero in midwinter to about 100° F. in midsummer. Both winter and summer temperatures are somewhat lower in central Pennsylvania, because of its altitude. The mean annual temperature there is about 44° F. Average temperatures in western Pennsylvania are intermediate to those of the central and eastern parts. A considerable difference in mean annual temperature exists between the northern and southern parts of the State; the northern mean is about 44° F. and the southern, about 52° F.

Annual precipitation in Pennsylvania averages about 42 inches. From 7 to 11 inches of this total is snow, heaviest in the northern and mountainous areas.

*Geologic Sketch*

The geologic history of Pennsylvania, like the history of the State's founding fathers, is varied and dynamic. Rocks exposed within the State span more than 600 million years of geologic time. They record flooding by seas and swamps, mountain building, volcanic activity, and glaciation, interspersed with long periods of general stability. Each of these epochs has contributed to the cornucopia of natural resources that has made Pennsylvania one of the Nation's principal sources of raw materials.

Deciphering the history of the rocks poses difficulties similar to translating an ancient decayed manuscript, parts of which have been lost. The oldest rocks in Pennsylvania, exposed only in the southeastern part of the State, have been subjected to the stresses in the earth's crust, and have been covered by thousands of feet of younger rocks. Although they are more than 600 million years old, they are among the youngest of the earth's ancient "basement" rocks. (Modern determinations show that the most ancient rocks in the earth were formed at least 3,000 million years—an almost incomprehensible length of time—before the formation of Pennsylvania's oldest rocks.)

The next major era of geologic time lasted approximately 375 million years, during which Pennsylvania was a lowland or basin in relation to higher land to the east. In the earliest part of this era, a sea that covered Pennsylvania was gradually displaced by sediment eroded from the eastern highland. The quartzite and shale that flank the ancient "basement" rocks and form part of South Mountain in south-central Pennsylvania were deposited at that time.

Periodically, the eastern landmass was raised higher and higher. Pennsylvania was affected each time, usually by a tremendous increase in the deposition of material washed down from the east. During several of these periods of uplift, rocks in eastern Pennsylvania were folded and faulted.

General subsidence in the following period caused the sea to reinvade Pennsylvania. Limy sediments which accumulated on the sea bottom were consolidated into the limestone that has provided most of the raw material for Pennsylvania's flourishing cement industry. Black muds that accumulated on top of the limestone were consolidated into shale and later squeezed and metamorphosed into the slate that is quarried in east and south-central Pennsylvania. Thin beds of volcanic ash in this rock sequence indicate that several eruptions occurred during the marine invasion.

The next period of uplift brought widespread deposition of coarse sand over Pennsylvania and adjoining States. Delaware Water Gap, one of the most scenic features of eastern Pennsylvania was cut by the Delaware River in rocks consolidated from this coarse sand.

During the following 50 million years, the lowland that was Pennsylvania was inundated by the sea many times then raised above it again and again. Salt beds were deposited in north-central Pennsylvania early in this period. Later accumulations of limy sediments, black

muds, and sand have yielded large quantities of petroleum and natural gas.

Forces in the crust again lifted the area to the east. A huge delta developed over much of the State. Its thickest part, 9,000 feet deep, lay northeast of Harrisburg.

Intensified crustal disturbance deformed the rocks in easternmost Pennsylvania. Rapid erosion of the eastern highland followed and again, coarse sediments blanketed the State. The conglomerates and sandstones which cap the higher knobs of the Pocono Mountains of eastern Pennsylvania and form many of the ridges in the Valley and Ridge province of central Pennsylvania, are remnants of these deposits.

The Pennsylvanian Period followed, during which the most important coal deposits ever encountered by man were laid down. Swamps containing thick stands of vegetation were covered by influxes of sediment; some were inundated by the sea from the west. Layers of vegetable matter were later transformed to coal. The Pennsylvanian rock sequence, which underlies almost half the State, has provided four-fifths of the mineral wealth of Pennsylvania. More than 50 coalbeds were formed during this period, the most remarkable being the Pittsburgh coalbed which is more than 10 feet thick and covers an area of 6,000 square miles in western Pennsylvania and adjoining States.

Coal swamps continued to develop long after the end of the Pennsylvanian Period, but the younger coal-bearing rocks are preserved only in the southwestern part of the State. The coal deposits were still forming as another great disturbance began in the eastern part of the State. Great folds and faults developed, forming the Appalachian Mountains. Most of Pennsylvania was affected by the disturbance; some of the rocks were metamorphosed because of the great pressure that was exerted on them. Coal in the eastern part of Pennsylvania was metamorphosed to anthracite; coal in the western part of the State and farther from the center of deformation was converted to high-quality bituminous coal.

The pattern of geologic events in Pennsylvania changed considerably after this great crustal disturbance. Much of the State was transformed into an eroding mountain mass. Northeastward-trending depressions which formed near the core of the mountain mass about 200 million years ago were filled with thousands of feet of red sediments. Molten rock from far below the surface was injected into these sediments; some of the molten rock may have reached the surface but most cooled and crystallized underground. Little Round Top and Round Top at Gettysburg, which figured so prominently in one of the great battles of the Civil War, are eroded remnants of this crystallized rock. The magnetite iron ore mined at Cornwall resulted from a chemical reaction that occurred when molten rock invaded a limestone formation that had been deposited 300 million years before.

Regional uplifting and erosion has dominated the pattern of geologic events in Pennsylvania almost continuously since injection of molten rock. The only record of deposition since that time is preserved near Philadelphia, where sediments eroded from the interior of Pennsylvania began to accumulate about 150 million years ago. These sediments indicate that the extreme southeastern part of the State was below sea level for a period of about 15 million years.

The more recent geologic record is much clearer in Pennsylvania. A general change in climate about a million years ago affected all of North America. Great continental glaciers, or sheets of ice, advanced from the Polar region as far south as northern Pennsylvania. The ice sheets advanced several times, carrying great quantities of rock debris. Thick deposits of glacial debris accumulated when warmer weather returned and the ice melted about 15,000 years ago. Lake Erie, the other Great Lakes, and many of the small natural lakes of northern Pennsylvania were formed by the glaciers.

Geologic history thus reveals that physical action which has been taking place for millions of years contributes to Pennsylvania's tremendous mineral wealth. However, the mountains, valleys, stream-cut plateaus, rolling hillsides, and lakes that make Pennsylvania one of the most scenic States of the Nation have been carved by her beautiful meandering rivers and by great ice sheets in the last few instants of geologic time.

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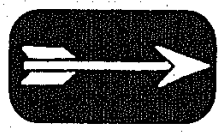
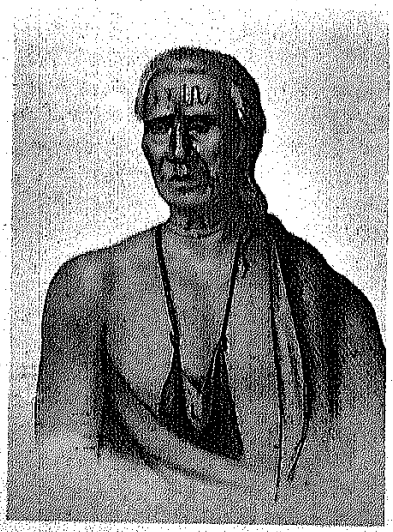
Chief Cornplanter, a Seneca Chief.



Lap-Pa-Win-Soe, a Delaware Chief.



Man has probably been in Pennsylvania between 12,000 and 18,000 years; however, since there are no written records, archeological records must be trusted to tell the story of the early Indian. According to these records, the first local Indians were nomadic people who lived by hunting. Later, they became village dwellers who gardened, hunted, made pottery and worked with a variety of tools. By the 17th century, there were five distinct Indian peoples living in Pennsylvania.

### *The Delawares*

The Lenni Lenape, or "original people," known as the Delawares, were a loose confederation of Algonquian tribes who migrated to Pennsylvania from the region west of the Mississippi after years of wandering. At the beginning of the 17th century they occupied an area from Delaware Bay to Manhattan Island and up the west bank of the Hudson to Kingston, N.Y. This northern branch of the Delawares later divided into three clans from which many others sprung, among them the Mohicans and Nanticokes. In Pennsylvania the principal Delaware village was Shackahaxon, now part of Philadelphia, where William Penn met with the Delawares and two other tribes to confirm his treaty of "purchase and amity."

The Delawares had political rank among the other tribes and they were afforded special dignity and authority for many years. By the time Penn came to Pennsylvania, however, they were in decline. He found only a few thousand Delawares and they were fast becoming vassals of the powerful Iroquois Confederacy.

### *The Iroquois*

The territory of the Iroquois lay mostly to the north of Pennsylvania, extending across upstate New York. Their confederacy of tribes was a highly sophisticated political organization.

The Iroquois conquered or completely destroyed many neighboring tribes through their highly organized techniques of warfare. Directing all their movements by system and policy, they never attacked until spies scouted and identified the enemy's vulnerable points, and every precaution was taken to make sure that they were not overcome by another tribe using the same method.

### *The Susquehannocks*

When the white man set foot in Pennsylvania, the Susquehannocks, like the other Indians of the area, were primarily an agricultural people. A matriarchal society, they lived in the Susquehanna River basin in stockaded villages, each headed by a chief.

In 1676 the Susquehannocks were conquered by the Iroquois and forced to settle in New York State. Later they returned to Pennsylvania, and suffered great losses in a massacre by the white man in 1763.

### *The Monongahelas*

The Monongahelas lived on the upper Ohio River and its tributaries. Their culture was evidently derived in part from the highly developed culture of the Indians of the Mississippi Valley. Like the Susquehannocks, they resided in stockaded villages, situated often in commanding positions on hilltops, and lived by farming, hunting, and fishing. Their artistry is evidenced by the many handsome stone and pottery fragments found in the valley area.

The Monongahelas unaccountably disappeared from the area. It is not known whether they moved away of their own volition or were wiped out by war or disease. A popular hypothesis is that they were destroyed by epidemics originating with white men. Some theorize that the tribe may have been wiped out in the crossfire of the Iroquois-Susquehannock war. At the conclusion of this war, in the early years of the 17th century, whole sections of western Pennsylvania were bare of inhabitants. The area was later to be occupied by bands of other Indians, among them the Delawares and Shawnees who had been pushed out of their homes in eastern Pennsylvania.

### *The Eries*

It is not known whether the populous, sedentary Eries were a single nation, a confederacy, or a neighborhood of separate peoples thrown together by chance of war. These people were known as the Cat Nation due to the prevalence of wild cats and panthers in their territory. Recorded history gives only glimpses of these people of Iroquoian stock who were related to the Hurons and Susquehannocks as well as to the Senecas and other members of the Iroquois Confederacy.

From 1655 to 1656 they were attacked and conquered by the Senecas, most warlike of the Iroquois tribes. This war resulted from the accidental killing of a Seneca by one of several Erie ambassadors who had arrived at the Seneca capital to renew the existing peace between the two tribes. In retaliation, the Senecas killed all but five of the ambassadors and vowed to exterminate the tribe.

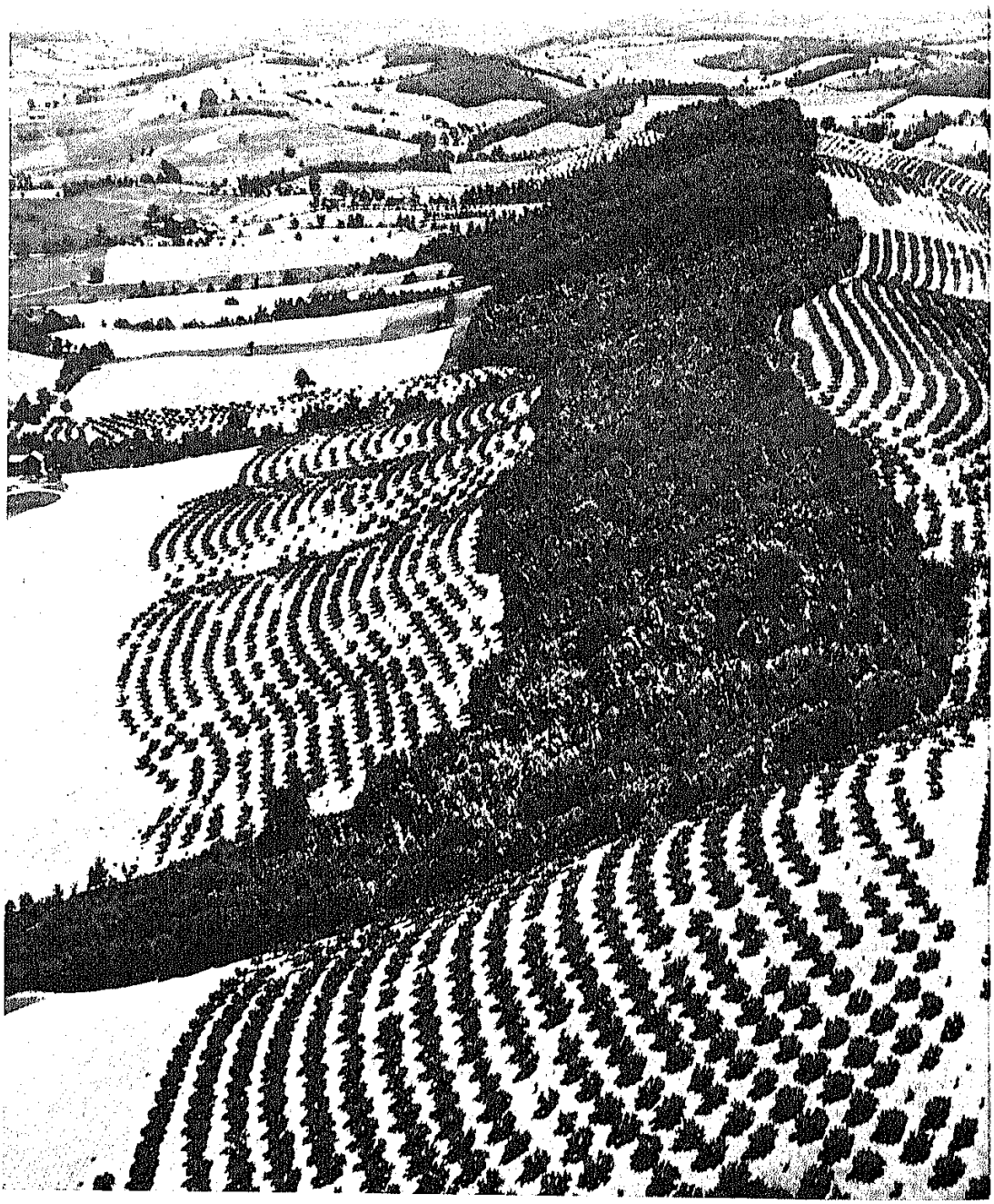
### *The Indian Wars*

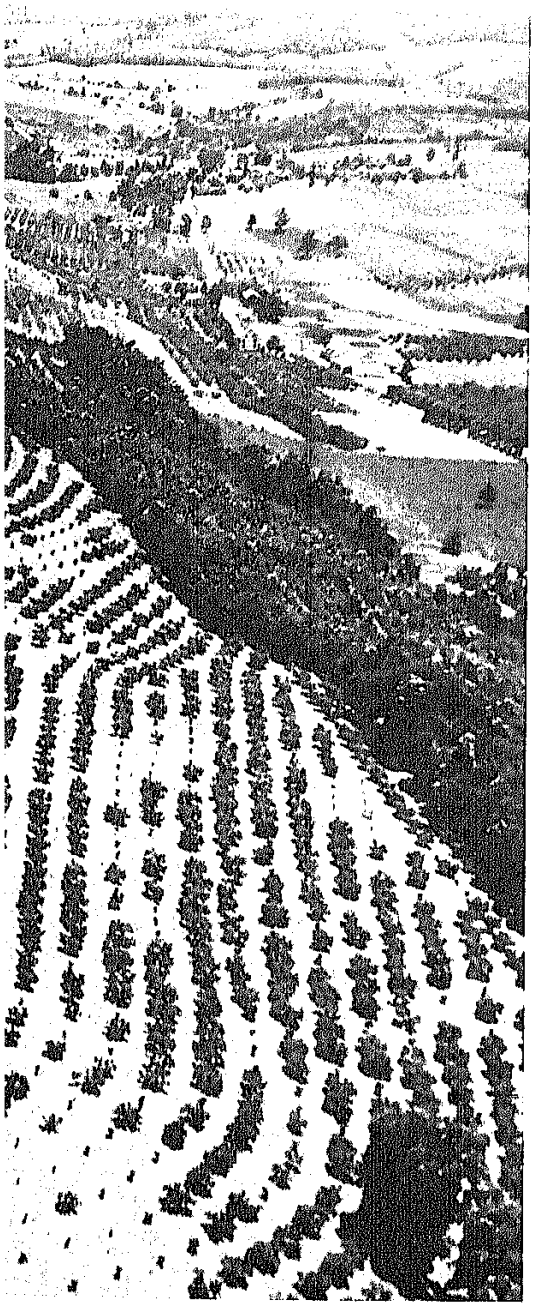
The Indians of Pennsylvania were plagued with war which literally drenched the frontiers with blood. In addition to tribal rivalries, raids, and murders, the Indians battled the French and the land-hungry English and were involved in border raids during the American Revolution.

The colonial period was marked most significantly by Pontiac's War, resulting from British violations of agreements, and Lord Dunmore's War, precipitated by the settling of Virginians upon land claimed by the Indians.

Pennsylvanian Indian citizens have no special trust relationships with the Federal Government today.

The 600-acre Cornplanter Reservation is not a true reservation but a land grant given by the Commonwealth of Pennsylvania to Chief Cornplanter and his heirs for Cornplanter's "many valuable services to the whites."





Forests virtually covered the entire area of Pennsylvania when Europeans first saw it, but soon farmers began to clear the timber and plant seeds in the rich soil; from the time of its first settlement until well into the 19th century, Pennsylvania was known as the "breadbasket of America."

The Swedes extensively farmed the fertile southeastern part of the State before the arrival of William Penn. They introduced livestock and poultry, planted orchards, and raised wheat and rye in addition to corn. Their cleared patches resembled those of the Indians, but the crops which they produced were larger and more varied. Farming spread throughout the Cumberland Valley, the Appalachian ridges, and the territory drained by the Susquehanna River. The southwest lent itself to grazing where sheep fed on hills too steep for cultivation.

### *Agriculture Today*

Today agriculture ranks with mining and manufacturing as one of Pennsylvania's chief industries. About 40 percent of the State's 29 million acres is farmland, including 5 million acres in crops and 6.8 million acres in pasture and woodland. The combined total value of its 91,000 farms, including buildings, equipment, livestock, and crops, is more than $4 billion.

Climate, soil, altitude, and length of growing season contribute to the wide variety of crops. Pennsylvania leads all other States in production of dairy products, cigar leaf tobacco, mushrooms, and sausage products. It ranks among the top five States in cherry, peach, grape, and apple production. The largest apple processing plant in the world is located in Adams County and the largest grape processing plant in the Nation is served by the Erie region's

Scientific management can improve the yield on farmland. The soil and terrain of this land dictated the use of contour farming to produce a good crop of peaches.

vineyards. Potatoes, oats, hay, and rye are also important crops.

Certain areas in Pennsylvania specialize in particular crops. Lancaster County has become renowned for its cigar leaf tobacco; Lehigh and Potter, for potatoes; and Franklin County, for fruit trees, especially peach. Truck farming is important near the larger cities.

As elsewhere in the Nation, farm population has been declining while productivity has been increasing. Two figures are particularly revealing: Pennsylvania ranks 32d among States in farm acreage but 14th in the value of its farm products. The figures pay tribute to the efficiency of Pennsylvania farms, which produce more wheat per acre than any Midwest "wheat belt" State and grow more corn per acre than the national average.

Cash income from marketing of Pennsylvania's farm production amounts to $800 million annually. Of this, roughly 70 percent comes from the sale of livestock, including poultry and eggs. Pennsylvania leads the Nation in milk sold on farms and in cash income from chickens, turkeys, and eggs. Bucks and York Counties are leading areas in livestock production.

*Forest Resources*

Pennsylvania forests, which cover more than half the State, annually yield more than $1 billion worth of wood products. The State's predominant hardwoods, which compose most of the forest area, are red and white oak, hard maple, beech, and yellow birch. Chief softwoods are hemlock and white, red, and jack pine.

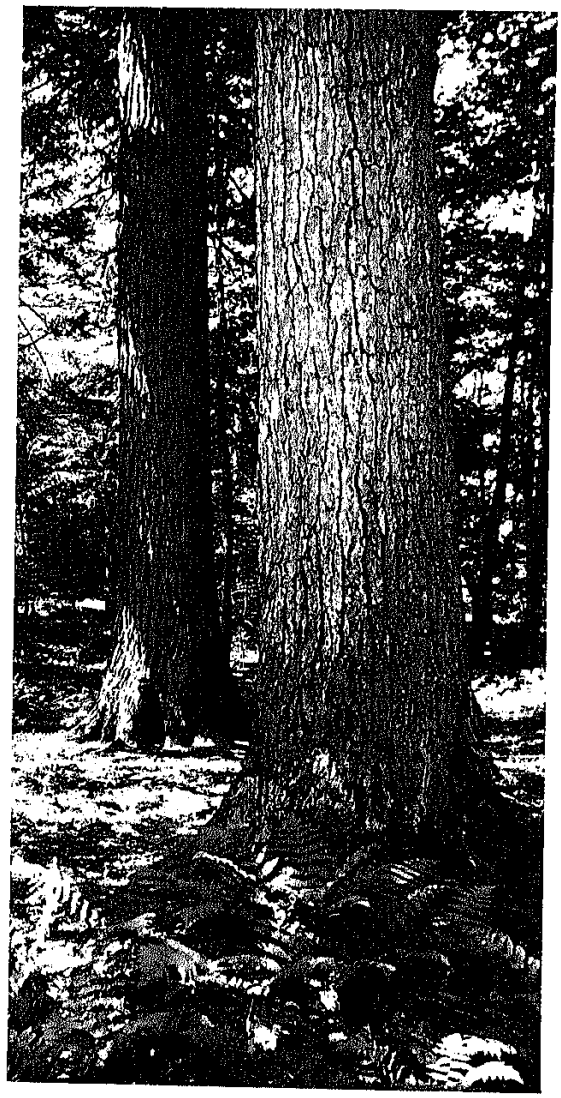
The annual timber harvest in the State is about 1 billion board feet, but only the highest quality wood is used for lumber and veneer. Most is converted to other products, such as wood pulp, paper, and paperboard. Total volume of stock growing on commercial forest lands in the Commonwealth is about 14,929 million cubic feet.

Less than one-fourth of Pennsylvania's forest lands is owned by public agencies. More than half is in the hands of miscellaneous private

(Left) Farm buildings lie concealed by the rolling countryside of the Corey Creek Basin in Tioga County.

(Center) Holstein cattle graze on river-bottom land near the East Branch Brandywine in Chester County.

(Below) A grove of eastern white pine more than 400 years old can be seen in the Allegheny National Forest.

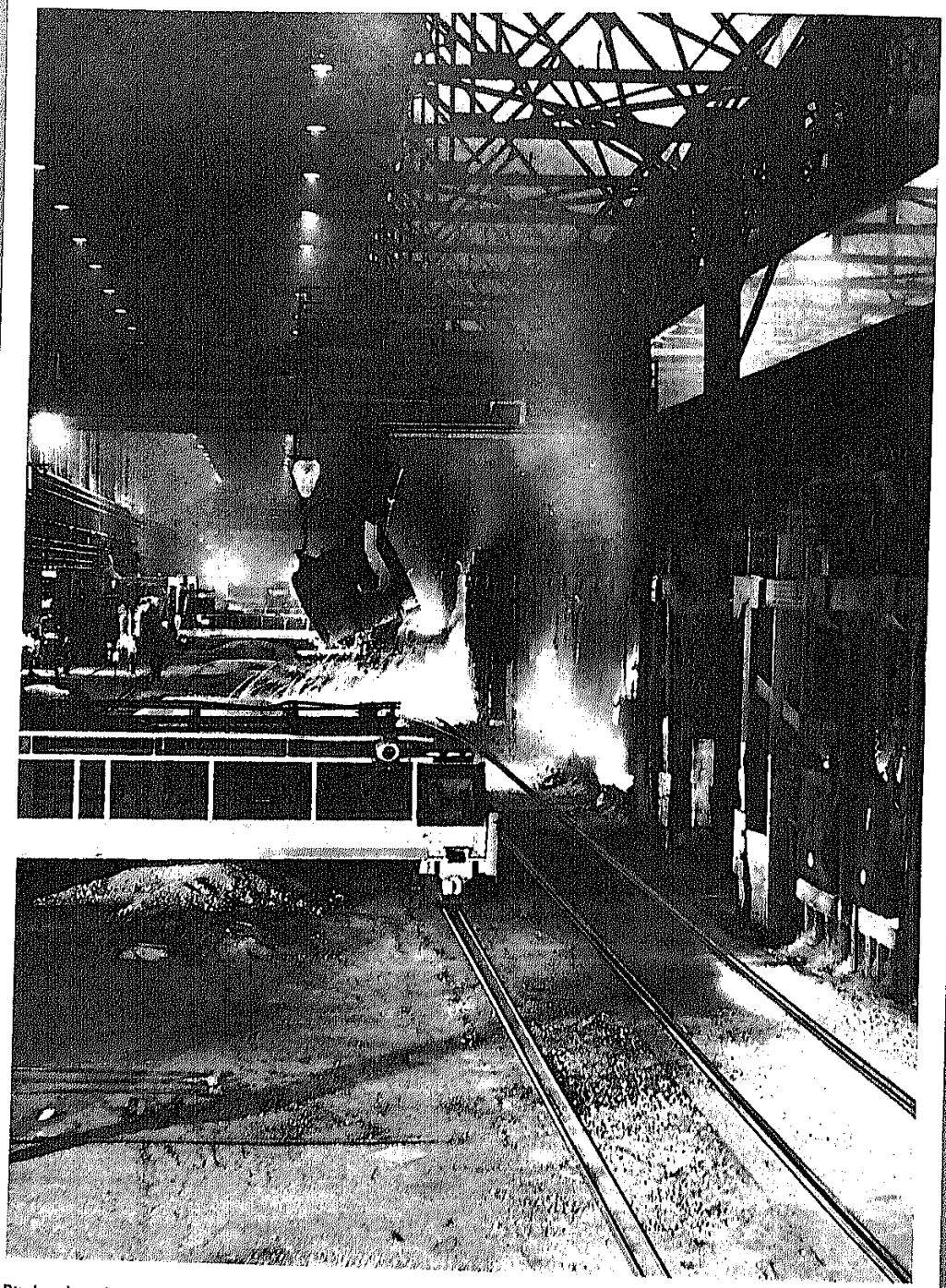


owners. Of the remainder, the forest industry itself accounts for 3 percent and farmers, about 20 percent. In addition to its commercial forests, the State boasts about 25,000 acres of virgin timber.

*Forest Future*

Protection of forests, essential to their continued productivity, requires the cooperation of the State, the Federal government, and private individuals. Forest fires burn an average of 24,000 acres a year; forest fire control costs nearly $1 million annually.

Since the demand is mounting for wood and wood products, the future looks promising. With proper management and protection, more high quality timber can be grown. However, the question is whether the forests of Pennsylvania can meet expanding industrial needs without jeopardizing the recreational needs of the community. In the future the forests of Pennsylvania must supply expanding industry and provide more opportunities for recreation and watershed protection.



Pittsburgh and steel mills are almost synonymous. Here, a ladle adds molten iron to an open hearth furnace.

By developing and using its tremendous mineral wealth, Pennsylvania has become a leading industrial State. Minerals and mineral fuels helped to make Pennsylvania a keystone of economic progress in the eastern United States even in colonial days.

Brickmaking, stone quarrying, and glass manufacture were among the earliest industries, and iron mines reportedly were worked as early as 1708. William Penn was one of the first to realize Pennsylvania's potential. He had owned an ironworks in England and recognized the importance of ore deposits in his new colony.

Pennsylvania's first iron forge was built in 1716 near the present site of Pottstown. Soon the river valleys in the eastern part of the State were dotted with "iron plantations," surrounded by virgin forests that provided wood for charcoal which was used in the blast furnaces and forges—in many cases at the rate of an acre a day. By 1771, roughly 50 forges and furnaces were in operation, most of them in the area now comprising Berks and Lancaster Counties. Later, an iron works near Johnstown became the first in America to achieve volume production of steel rails.

After the Civil War such industrial giants as Andrew Carnegie, Henry C. Frick, and Charles M. Schwab began to build the industry that was to make the name Pennsylvania synonymous with steel. Pittsburgh, in the heart of the bituminous coal region and having access to the ore mines of Lake Superior and other fields, gained an ascendancy in the industry that it still enjoys. The city today is the leader in a region that produces more steel—20 to 25 percent of all the steel produced in the United States—than most nations of the world.

Development of vast deposits of coal, which spurred the growth of the iron industry, has been cited as the most important factor in Pennsylvania's industrial advance. Both anthracite and bituminous coal have been mined almost continuously since 1800, and huge tonnages still underlie much of the State.

The oil industry, concentrated mostly in northwestern Pennsylvania, also brought the State prominence. Self-styled "medicine men" were bottling and selling crude oil as a cure-all by 1820 and 30 years later it was commonly used as an illuminant. The petroleum industry was born at Titusville in 1859, when Col. E. L. Drake, a retired railroad conductor, drilled the world's first commercial oil well.

Natural gas, originally burned as a nuisance in the oilfields, was first pipelined for use as a domestic and an industrial fuel shortly after the Civil War.

Today, Pennsylvania's mining and mineral processing industries still pace the Nation. For years its mineral output has been valued at more than $800 million annually, and it frequently passes the billion-dollar mark. In mineral-production value, the Keystone State has always been the leader east of the Mississippi, and it has never ranked lower than fifth in the entire Nation.

Pennsylvania is first among the States in production of iron, steel, coke, cement, and stone, and second in output of coal and clay. It is a principal supplier of lime, pyrites, and tripoli (or rottenstone, used as an abrasive) and is the only domestic source of anthracite and cobalt.

### *Coal*

Bituminous coal, underlying almost all of western Pennsylvania, is the State's most valuable mineral product. With an estimated recoverable reserve of more than 35 billion tons, Pennsylvania's bituminous coal industry is now producing at the rate of some 65 million tons a year. This production, supplemented by anthracite from eastern Pennsylvania, makes her second only to West Virginia in output of coal. Much of this is a high-quality coking coal used in local byproduct ovens to make coke for Pennsylvania's

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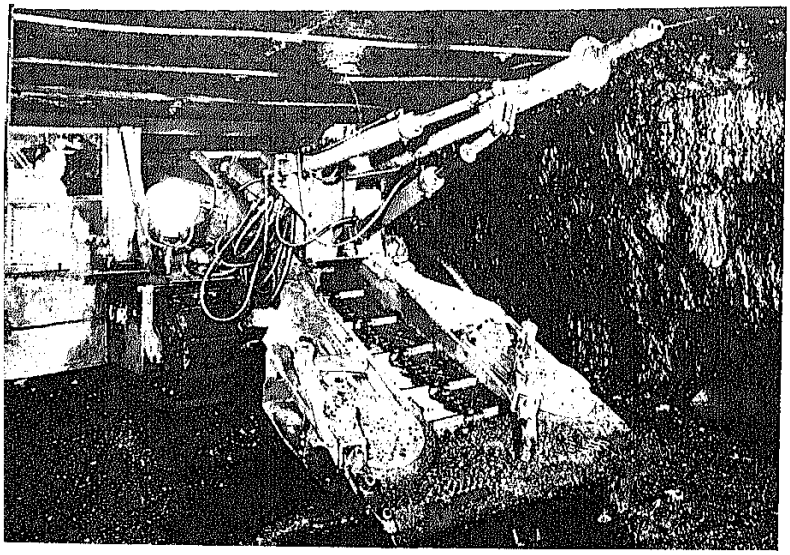


(Left) An experimental machine cuts coal with powerful jets of water which issue from the nozzle in the right foreground.

(Right) Workmen probing for natural gas prepare to attach a new length of pipe to the drill as the hole grows deeper.

iron and steel industry and to make valuable chemicals. Millions of tons also are shipped to other States and to countries throughout the world for blending with cheaper coals. Noncoking coal from Pennsylvania powers some of the world's largest and most efficient electrical generating plants.

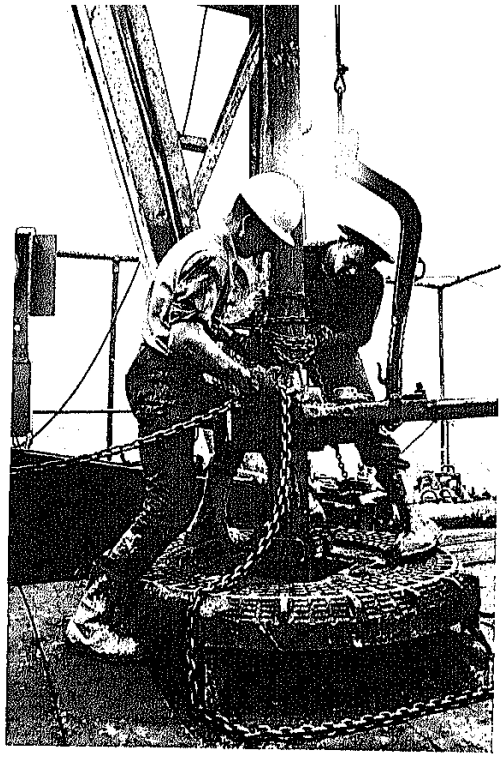
Anthracite from eastern Pennsylvania—frequently called "hard coal" in contrast to the softer bituminous variety—is the only mineral fuel of its kind available in the Western Hemisphere. Once anthracite was the prime domestic and railroad-locomotive fuel throughout New England and eastern Canada. Today, because it is extremely clean and easy to handle, it is still used in both of those areas and even in Europe, but primarily for space heating and for specialized filtering applications in chemical and sewage-disposal plants. Despite many years of production, enough anthracite remains to sustain production at the present rate for several centuries.

### *Petroleum and Natural Gas*

The Pennsylvania petroleum and natural gas resources that helped to establish America's first billionaire, John D. Rockefeller, and served as the foundation for many great, if lesser, fortunes have been substantially depleted over the years. Nevertheless, new reserves are found each year in Pennsylvania—sometimes as a result of deeper exploratory drilling and sometimes through advances in technology that make possible the extraction of still more oil and gas from fields that were first drilled nearly a century ago. The State has proved reserves of petroleum totaling approximately 77 million barrels and proved reserves of about a trillion cubic feet of natural gas.

Even after all the possible oil and gas have been removed, the fields continue to be useful. The Keystone State pioneered in developing exhausted fields for underground storage reservoirs of dry natural gas pumped in by pipeline from the Southwest. In the cold months, when consumption of gas for heating far exceeds local production, underground storage reserves make up the deficit.

Pennsylvania's statewide network of pipelines and its system of refineries continue to flourish, although much of the oil and gas processed comes from outside the State. Refineries that produce liquefied petroleum gases from Pennsylvania natural gas have had a total output exceeding 2.5 million gallons annually for several years. Many refineries in the eastern counties now process imported rather than domestic oil to make gasoline. Western refineries that have long specialized in the famous Pennsylvania grade lubricating



oils pay between $4 and $5 a barrel for Pennsylvania crude, at the well, about one-and-a-half times as much as the average price of American crude oils.

*Metals*

The small surface deposits of iron ore that supported the early ironmaking industry in Pennsylvania have long since been mined out. There are still, however, two important underground iron ore mines, one in Berks County and one in Lebanon County. The latter yields not only a first-class iron ore, but also copper, gold, and pyrite (chiefly sulfur and iron) that constitutes the only commercial domestic source of cobalt.

Most of the iron ore processed by the State's giant steel industry comes from Minnesota, Michigan, and northern Canada, or is imported from Labrador, Africa, and South America. Even so, Pennsylvania coal, coke, and limestone, processed by a highly trained labor force in modern plants, keeps the State foremost in steelmaking. Pennsylvania is also an important source of ferroalloys—mixtures of iron and other metals—that are produced from imported ores in electric furnaces and in blast furnaces only slightly smaller than those that make pig iron for the mammoth steel mills. Pennsylvania blast-furnace slag, a 6-million-ton-a-year pig iron byproduct, is becoming increasingly valuable as an aggregate for making concrete and as ballast material for railroad rights-of-way.

Pennsylvania's aluminum industry, oldest in the Western Hemisphere, was for more than half a century the world's largest in all respects. It is still among the leaders in processing, fabrication, and research. Primary metal used by the industry is brought in from other States to be alloyed and shaped at New Kensington and other plants.

Zinc ore is mined and milled near Friedensville, and zinc concentrates derived from this mine, other domestic sources, and imports are roasted and reduced to slab zinc in plants at Palmerton and Josephtown. Other products produced at these plants include byproduct sulfuric acid, cadmium, zinc oxide, zinc dust, rolled zinc, and zinc-base alloys.

*Nonmetallics*

Various forms of stone—cement rock, limestone, and others—are quarried in 49 of Pennsylvania's 67 counties. After coal, stone is the State's most valuable mineral raw material; production of dimension stone and the crushed limestone used in steelmaking are worth well over $80 million a year.

Other nonmetallic minerals produced in commercial quantities include sand and gravel, excavated or dredged in almost every county; portland cement, manufactured in all parts of the State; clays for ceramics and refractories; iron oxide for making pigments; dolomite from which magnesium compounds are obtained; and mica, talc, and tripoli. Sulfur is recovered as a byproduct in the liquid purification of natural gas.

In Pennsylvania, the industrial and economic strength inherent in mineral wealth has been realized to an extent rarely achieved elsewhere. Many of the industries founded on the State's original mineral resources are continuing to grow and prosper long after those resources have been substantially depleted.

The mighty Delaware River notches its way seaward through the picturesque Pocono Mountains.

# Water and Power

In the past there has been an abundance of good water in Pennsylvania. If all water resources were adequately developed, there would be still, but drought at times threatens the supply, as does pollution. The people of the Keystone State face a situation common to most thickly populated areas. They must stop the deterioration of the water resource, reclaim that which has been polluted, and plan so that the available supply is properly developed.

From the early days of colonization until the present, water has greatly influenced the development of Pennsylvania. Navigability of the rivers and good land transportation routes along the valleys of the river systems have affected the distribution of population and the location of manufacturing complexes and cities.

The Susquehanna River and its tributaries, for example, helped expedite the settlement of the heavily wooded central, northern, and western parts of Pennsylvania. Breaching the Appalachian ridges which separated the southeastern area from the rest of the State, they offered the only practical routes into the west.

As the State prospered, canals, highways, and railroads began to crisscross Pennsylvania. Early in the 19th century, Philadelphia prevailed upon the State legislature to construct a remarkable network of canals—supplemented by a railroad from Philadelphia to the Susquehanna River—that eventually linked Pittsburgh to the Port of Philadelphia.

### *Water for Industry*

Excellent inland waterways which provided power and a means of transportation, were essential to the State's industrial development. Early iron furnaces made use of the abundant water power of short tributary rivers to operate the bellows and the huge hammers that "wrought" iron. Ore and fuel were frequently brought from the mines and forests to furnaces by boat.

As steam engines became more efficient they replaced water power and larger iron furnaces

were built in more desirable locations. However, water was still vital for cooling and therefore, larger quantities became necessary for the iron and steelworks. Great steelworks today are characteristically situated on large rivers and the shores of lakes, as are refineries, textile plants, steam powerplants, and other installations that depend on water for cooling.

*Hydroelectric Power*

Most hydroelectric developments are located on the Susquehanna and Lackawaxen Rivers in the eastern part of the State and the Clarion River in the west. Total hydroelectric power resources are estimated at some 3,721,600 kilowatts. About 434,000 kilowatts—or 12 percent of the hydropower resources—have been developed.

The average annual generation from the State's existing plants is estimated at 1,817 million kilowatt-hours. The largest single installation in the State is the 230,000 kilowatt Safe Harbor Plant of the Safe Harbor Water Power Corp. on the Susquehanna River.

*Transportation and Other Uses*

Today the most navigable Pennsylvania waterways are the Allegheny, Delaware, Monongahela, and Ohio Rivers. The Delaware Valley, which includes ports at Philadelphia, Camden, and Trenton in New Jersey, and at Wilmington in Delaware, has become one of the largest centers for imports in the Nation. Another outlet to the world's ports was created by the development of the Port of Erie to serve ocean-going vessels using the St. Lawrence Seaway.

Western Pennsylvania rivers are important transportation arteries. Barge traffic on the Allegheny, Monongahela, and Ohio Rivers carries more than 30 million tons of coal, petroleum, steel, and manufactured products yearly to and from the vicinity of Pittsburgh.

Despite Pennsylvania's tremendous urban and industrial development, the concentration of factories and cities on the larger rivers left the smaller streams and lakes in excellent condition for recreation. The State has more than 45,000 miles of flowing waters with many streams providing some of the finest trout and warm water fishing anywhere in the Eastern United States. Mountain lakes and waterfalls add to the scenic and recreational enjoyment of visitors to the Keystone State.

*Ground Water*

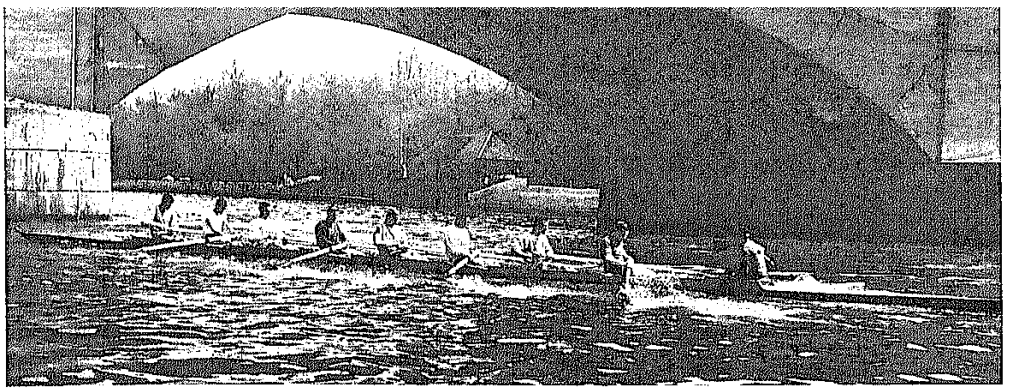
Water found in geologic formations below the earth's surface is called ground water, and Pennsylvania is blessed with an abundance of this resource. During dry seasons the State's rivers and streams are sustained by ground water overflow, yearly obtaining about 40 percent of their flow from springs and "seeps" along their routes.

Human use of ground water is widespread in the Commonwealth. Rural users account for over 100 million gallons daily; another 100 million gallons per day is needed for public water supplies; and industry requires about 300 million gallons daily. However, Pennsylvanians still use about 10 times more surface water than ground water, and in many areas of the State abundant ground water resources go largely undeveloped. Underground sand and gravel beds deposited by glaciers are particularly good aquifers, and much greater use can be made of them in the future.

*Water Quality*

As early as 1905, Pennsylvania passed a "Purity of Waters Act" to attack sewage disposal problems. In 1923, it became the first State to establish a water pollution control agency. Today, under the "Clean Streams Law" of 1937 and later amendments, Pennsylvania is a nationally recognized leader in this important phase of water conservation. Nevertheless, this highly populated, heavily industrialized State—where water quantity is quite ample—faces serious and challenging problems in water quality.

More than 350 communities, mostly in coal mining areas, have inadequate or no sewage treatment for their 1.6 million people. Still, the State as a whole is making commendable gains against municipal pollution. An outstanding example of progress is the Allegheny County Sani-



Today, the Schuylkill River can be enjoyed by those who once referred to it as "too thick to drink, to thin to plow."

tary Authority's sewage interceptor and treatment system. Seventy communities joined with the city of Pittsburgh in this project of the late 1950's which now protects the waters of the Allegheny, Monongahela, and Ohio Rivers from municipal pollution in this widespread metropolitan area.

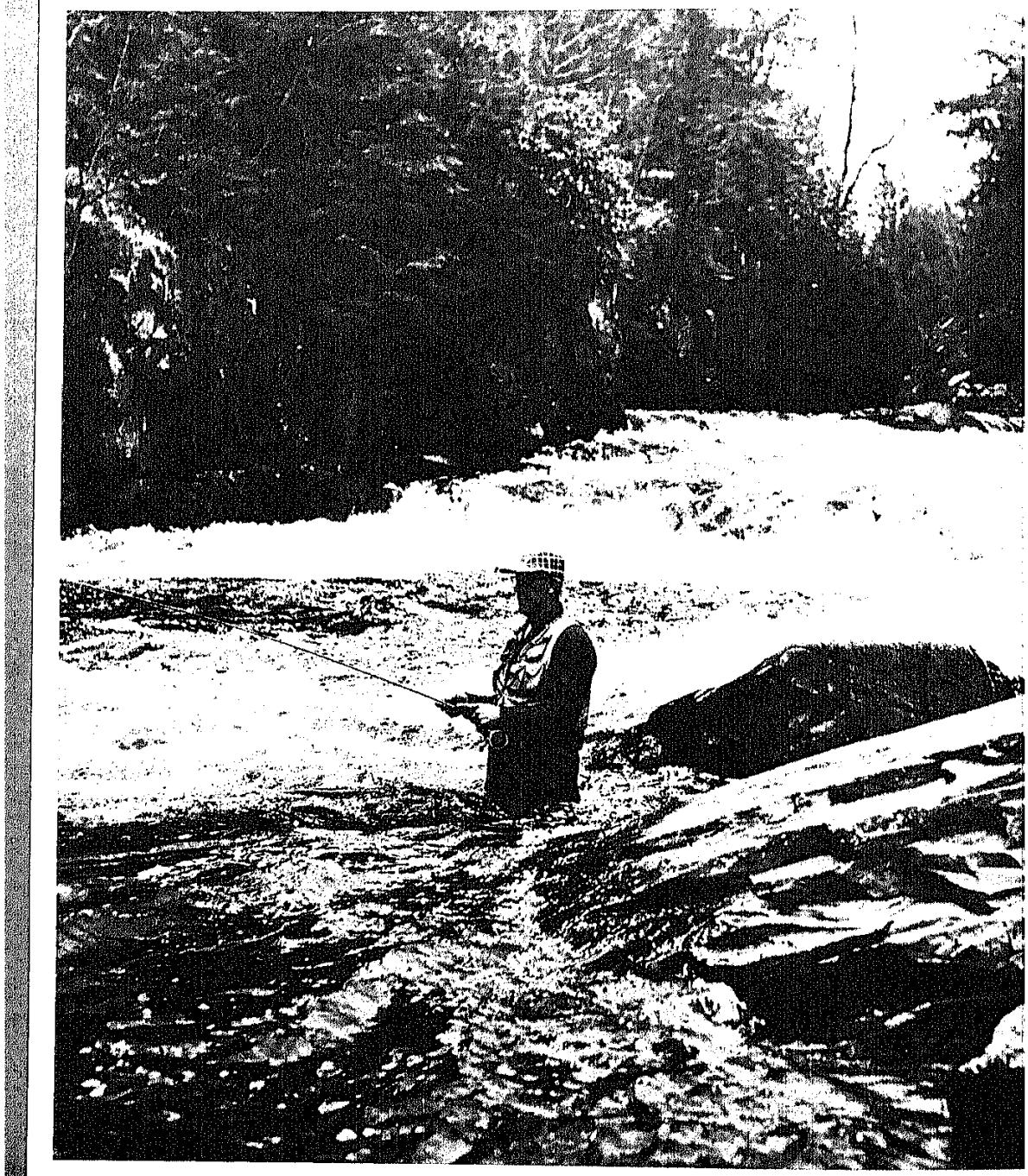
As a top ranking manufacturing State, Pennsylvania's industrial wastes are understandably voluminous and varied. Wastes from such industries as pulp and paper manufacture and food processing have long posed pollution problems but are increasingly being brought under control. Today, 90 percent of the 1,500 industries discharging wastes to the waters of the Commonwealth are either in compliance with, or making satisfactory progress toward, State Sanitary Water Board requirements.

Pennsylvania's most serious water pollution problem is acid coal mine drainage, mostly from abandoned mines. Approximately 2,000 miles of stream waters are adversely affected by this century-old problem, caused when water draining from mines is laden with sulfuric acid formed from sulfur compounds associated with the coal. The waters of such streams as the West and North Branches of the Susquehanna, the Conemaugh-Kiskiminetas, and the Monongahela Rivers are affected. Recently the State has proposed a 10-year, $250 million plan to abate acid mine drainage. In its move against this form of pollution, the State is using strong legislation and seeking technical solutions to the problem.

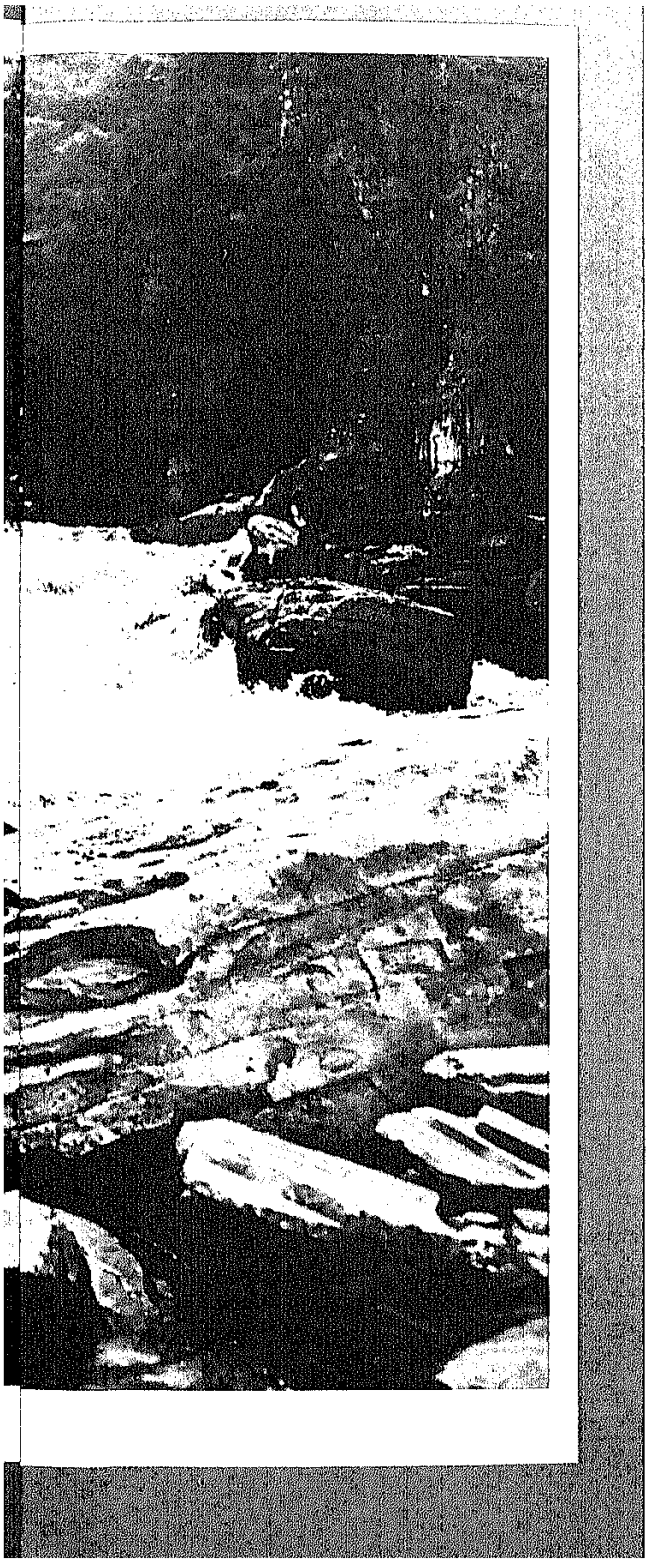
The Schuylkill River Restoration Project is unique among Pennsylvania's stream reclamation programs. Rising in eastern Pennsylvania's anthracite coal mining region, the Schuylkill 25 years ago was often referred to as "too thick to drink, too thin to plow." Tremendous quantities of silt from decades of coal processing and culm bank erosion choked the river, and all along its banks, communities dumped in untreated sewage. Then administrators of the Clean Streams Law chose this river for their first major project. Sediment removal alone required 4 years of dredging—a control measure still in periodic use. At the same time, the State required coal washeries and municipalities to install waste treatment facilities. Today, the Schuylkill can be used as a source of municipal and industrial water from the Reading area to its mouth—a distance of 90 miles.

Pennsylvania is one of the few States which requires reimbursement by the offender for fish killed by pollution. Some $23,000 was paid voluntarily and by court action for fish kills occurring in a recent year. The Pennsylvania Fish Commission has developed an excellent system whereby fishermen and others are urged to report fish kills observed. By immediate follow-up on the reports, the Commission can often determine the cause and pinpoint sources of pollution.

Pennsylvania recognizes that water problems don't stop or start at State boundaries. The State water pollution control program has been coordinated with programs of other States sharing its river basins. Pennsylvania is a member of the Delaware River Basin Commission, the Interstate Commission on the Potomac River Basin, the Ohio River Valley Water Sanitation Commission, and the Great Lakes Commission. It also is participating in the North Atlantic Regional Water Study and the Northeastern Water Supply Study.



With many waterways stocked, an angler can be confident that his outing will be a success.



In spite of its dense population and its position as third largest industrial State, Pennsylvania is one of the best hunting States in the country. Its rolling hills and farmlands interspersed with woods and open spaces provide an abundance of rabbits, pheasants, squirrels, grouse, and deer.

The Keystone State leads the Nation in the number of wild turkeys harvested during each hunting season and is usually one of the top three States in the take of white-tailed deer. Five hundred or more bears may fall to hunters' guns during the annual 1-week season.

In addition to "big game," upwards of 2 million cottontails, half a million pheasants, three quarters of a million squirrels, and tens of thousands of grouse, quail, snowshoe hares, woodcock, ducks and geese, woodchucks, and doves are taken annually.

Fur-bearing animals—raccoon, skunk, mink, muskrat, and red and gray foxes—round out the picture. Wildcats, while not an abundant species, still survive in some of the more remote mountainous areas. The trappers' harvest of furs is worth from $1 to $2 million annually.

The Pennsylvania Game Commission has the task of maintaining wildlife recreational opportunity for Pennsylvania hunters. In a recent year, more than 1.25 million licenses, including tags and permits for special hunts, were issued, netting the State $4.25 million for use in managing its wildlife resources. Pennsylvania attracts more nonresident hunters than any other State.

### *Wildlife Conservation*

Under its Game Commission Pennsylvania established its first wildlife refuge in 1905, and has continued to add others. One of these, the 3,700-acre Pymatuning Waterfowl Refuge, in northwestern Crawford County, is a mecca for bird watchers. It is a favorite feeding and resting place for the thousands of waterfowl that move through the State each year. Many remain to nest.

Since 1917 under the Auxiliary Game Preserve Act, large numbers of sanctuaries, primarily for

small game, have been created on leased lands. Today just under a million acres of State lands under the Game Commission supplement other public and private lands in providing public hunting opportunities.

The State's Pymatuning Goose Management area typifies the waterfowl hunting opportunity Pennsylvania affords its sportsmen. During the first hunting season in this area (1962), nearly 3,000 hunters bagged more than 2,000 Canada geese. The Pymatuning project is recognized as a good example of sound wildlife conservation. With the help of Federal funds, the State is constantly expanding and improving the habitat, production, and harvesting of the wildlife resources.

A cooperative game farm program begun in 1936 has added more than 1¼ million acres of farmland from nearly 12,000 farms to the State's hunting and game production areas. Six game farms—three for ring-necked pheasants and one each for bobwhite quail, wild turkey, and mallard ducks—are operated by the State. In a recent year, the Commission oversaw the release to suitable areas of more than 700,000 young pheasants, 27,500 quail, 11,500 young turkeys, and nearly 22,000 mallards. In addition, 110,000 rabbits were trapped in closed lands and released in hunting areas.

Project 70, a statewide recreational program allows for the acquisition of additional wildlife areas and hunting and fishing access points. With the completion of the program will come wider enjoyment of the State's rich wildlife heritage by both residents and visitors.

### *Big Game*

The first State refuges were located in State forests and stocked with deer obtained from sister States. With plenty of food and protection, white-tailed deer increased so rapidly that within two decades overpopulation became a problem. Unquestionably the most popular big game animal in the country today, the white-tailed deer is found in every county of the Commonwealth. A surprising number live very close to the great centers of population.

Recently, nearly 230,000 licenses were sold for the "antlerless deer" season, held annually to keep the deer population down to a le consistent with the food supply. Overpopulat often leads to winter starvation, and the hun deer can damage plant cover irreparably in th search for food.

The black bear became very scarce in Pe sylvania around the turn of the century, in 1905 the State passed the first protective for the species, declaring a closed season bears. Since then, other measures which pro cubs, outlaw certain kinds of traps, limit o seasons, and restrict ammunition have b instituted to assure an adequate populati State forests provide excellent habitat for animal which now numbers about 1,300. far the best bear hunting is concentrated in extensive forested mountain areas of central northern Pennsylvania. Top counties for b are Elk, Cameron, McKean, Potter, Clint Lycoming, Tioga, Monroe, and Pike.

The elk, largest of Pennsylvania's game mals, has been restocked on suitable range, a herd of some 75 animals live in inaccess areas in the mountains. No open season has b held on this animal for many years.

### *Game Birds*

Resident Pennsylvania game birds include f popular species. The exotic ring-necked pheas thrives in the more heavily farmed section the State, the southeast corner below the I Mountains, and in the border counties along Ohio line. The ruffed grouse the State Bir is a permanent resident in the wilder woo sections of Pennsylvania. The wild turkey saved from almost complete extermination lier in the century, and today may be found abundant numbers in central and northern Pe sylvania. The State offers some of the fir turkey shooting in the country. The woodco an upland shore bird, has many faithful follow because the woodcock season in Pennsylva starts in mid-October, fully 2 weeks bef grouse, pheasant, and quail shooting is j mitted.

Migratory game birds of Pennsylvania incl the woodcock, which nests in the State; mourning dove, prevalent throughout the most of the year; and migratory waterfowl, m

commonly found along the larger waterways in spring and fall. A few of the latter summer on lakes and streams of Pennsylvania. Most common of the ducks are black duck, mallard, baldpate, green-winged and blue-winged teal, redheads and canvasbacks. Other ducks seen in migration include the pintail, shoveller, bufflehead, oldsquaw, ruddy, and red-breasted and hooded mergansers. Canada geese, greater and lesser snow geese, and brant also use State waters and feeding areas. Most spectacular of the waterfowl is the great white whistling swan.

Hawk Mountain Sanctuary in Schuylkill County provides a haven for birds of prey. It is the first sanctuary of its kind in the world. Covering 1,400 acres of mountaintop, it attracts thousands of visitors who watch from the "lookout" as hawks sail past. In one day as many as 11,000 hawks have been counted passing along Kittatinny Ridge.

### *Sport Fishing*

About 200 species of fish are found in Pennsylvania's many lakes, streams, and ponds.

Among the State's valuable sport fish is the brook trout, Pennsylvania's only native trout, restricted to smaller, colder mountain streams. The adaptable brown or German trout, introduced many years ago from Germany and Great Britain, is found in larger, fast-flowing streams and occasionally in lakes and ponds. The rainbow, introduced from the Pacific Coast, can be taken in many of Pennsylvania's larger, fast-moving mountain streams, as well as in lakes and ponds.

Three bass species are found in Pennsylvania. The smallmouthed bass prefers rocky rivers and lakes with steep rocky shorelines; associated with it is the rock bass. The largemouthed bass is found in slow-moving streams and frequents shallow mud-bottoms of lakes.

Yellow perch, once common, are now largely restricted to streams and lakes free of pollution. A fish that has increased in favor with sport fishermen in recent years is the fallfish—a silvery member of the minnow family. Carp often reach 50 pounds and are much sought in some sections of the State.

The muskellunge, close relative of the great northern pike, may grow to 55 inches and weigh more than 50 pounds, testing the skill of the most expert fisherman. To meet the demand for the muskie, the Fish Commission has already stocked 37 State waters where this fish did not originally occur. Within 2 to 3 years after fry and fingerlings are placed in an area, catches of legal-size fish are reported.

Another fighter and close relative of the muskie is the pickerel—found largely in lakes and ponds of northeastern Pennsylvania. Other sport fish prized by fishermen include the walleye, white sucker, black and white crappies, bluegill, bullheads, shad, eel, and pumpkinseed sunfish.

In a recent year, more than 600,000 licenses (including tags and permits for special seasons) were purchased by sportsmen who paid the State more than $2 million to fish in Pennsylvania waters. Of these, about 24,000 were bought by out-of-Staters.

The State Fish Commission is actively engaged in stocking legal-size fish in the State's fishing waters; in providing more of these waters; in making existing waters more easily accessible and—through supplying public facilities—more enjoyable.

The Commission maintains 10 hatcheries that produce trout and warm-water fish for stocking the State's waters. Pennsylvania also has a cooperative agreement with the Department of the Interior for the stocking of trout waters with fish produced in national hatcheries. In a recent year, the Game Commission stocked a total of more than 19 million sport fish, weighing slightly less than a million pounds to maintain good fishing for Pennsylvania's growing number of fishing enthusiasts.

During the past three decades the annual commerical catch of fish by Pennsylvania fishermen in Lake Erie has ranged from 1 to 4.5 million pounds. A decline in the catch has occurred in recent years because of the great reduction in the lake's population of blue pike and walleye, due to pollution. Smelt now make up the major share of the catch, but yellow perch, white bass, sheepshead, yellow pike, whitefish, suckers, and cisco appear in lesser amounts.

An overnight canoe trip down the Delaware River is an adventure a boy will remember for a lifetime.

It is not hard to understand why recreation and tourism together constitute Pennsylvania's second largest "industry," ranking next to manufacturing. Traversed by mountains, blanketed by forests laced by streams, dotted everywhere with historica landmarks, the Commonwealth is especially rich in "recreational resources." From vigorous pursuits like skiing or camping, to more sedentary amusements like leisurely automobile tours, Pennsylvania can offer pastimes to suit every taste. To make sure that the State's recreational facilities will be able to meet expanded future demands, a $70 million program of land acquisition is now underway.

### *State Recreation Areas*

More than 100 State parks and recreation areas are maintained by Pennsylvania's Department of Forests and Waters. Picknicking, boating, swimming, fishing, and camping may be enjoyed at most of these areas.

Cook Forest State Park in Clarion County contains the largest stand of virgin pines in the State. Washington Crossing and Roosevelt State Park, Brandywine Battlefield, Bushy Run Battlefield, and Valley Forge are important historic sites. Some of the scenic attractions of Pennsylvania include the lakes and waterfalls in the Pocono Mountain resort area in the northeastern region; the 33 falls of Kitchen Creek in Ricketts' G en, west of Wilkes-Barre; Pine Creek Gorge, also called the "Grand Canyon of Pennsylvania," southwest of Wellsboro; the 23,013-acre, unspoiled wilderness of Bucktail State Park with its Bucktail Trail, winding alongside the Bennett Branch of the Susquehanna River through mountain gaps from New York to Maryland; Conneaut Lake, largest lake in the State; and the 70-mile shoreline of Pymatuning Reservoir in the northwest.

### *National Parks*

The National Park Service administers the following areas in Pennsylvania: Independence National Historical Park and Carpenters' Hall (privately owned), both in Philadelphia; Fort Necessity National Battlefic'd, Ge tysburg National Military Park and Cemetery, and Hopewell Village National Historic Site. Three other areas in the State have been authorized: Allegheny Portage Railroad National Historic Site, Delaware Water Gap National Recreation Area, and Johnstown Flood National Memorial.

*Independence National Historical Park:* Scene of the adoption of the Declaration of Independence, the meeting place of the Continental Congress and the Constitutional Convention of 1787, and the seat of the U.S. Government from 1790 to 1800, Independence Hall Park covers five Philadelphia city blocks. Its greatest attraction is the famous Liberty Bell. The prophetic words inscribed on its side in 1752 read, "Proclaim Liberty Throughout All the Land, Unto the Inhabitants Thereof," immortalizing man's greatest achievement—freedom.

*Carpenters' Hall:* This hall, located in Independence National Historical Park, was the meeting place of the First Continental Congress, from September 5 to October 26, 1774. That famous body was responsible for unifying the Colonies from Massachusetts to the Carolinas behind a policy of resistance to oppressive imperial policies

Carpenters' Company is the oldest builder's organization in the United States, dating back to 1724. Its members were responsible for much of the design and construction of the largest and best-built city of the American Colonies. Patterned after the guilds of England, the Carpenters' Company was founded "for the purpose of obtaining instruction in the science of architecture and assisting such of their members as should by accident be in need of support, or the widows and minor children of members."

Since its restoration in 1857, the Hall has been maintained as a historic landmark and kept open by the Carpenters' Company, which still holds meetings in it. Located on Chestnut Street between Fourth and Orianna Streets, Carpenters'

Hall has been part of the Independence National Historical Park since 1950, with the Carpenters' Company retaining ownership of the property.

*Fort Necessity National Battlefield:* This historic area was the site of General George Washington's first major battle and the opening engagement in a 7-year struggle between England and France for possession and control of North America. The conflict was known in America as the French and Indian War and in Europe as the Seven Years' War. The first major event in Washington's military career, it was also the only time he was forced to surrender.

Other historical areas in the vicinity include Braddock's Grave and Mount Washington Tavern (Fort Necessity Museum), built about 1818 as a stage station on the old highway, the principal artery between the Atlantic seaboard and the Ohio Valley in the early 1800's. The museum contains relics of the Washington and Braddock campaigns, along with household furnishings and industrial, agricultural, and military equipment of early America.

Fort Necessity National Battlefield is 11 miles east of Uniontown on U.S. 40. Group tours receive special attention if advance arrrangements are made with the Superintendent, Farmington, Pa., who is in immediate charge of the battlefield.

*Gettysburg National Military Park:* Scene of the dramatic Battle of Gettysburg, this park commemorates the turning point in the American Civil War. The Gettysburg Address Memorial stands at the west end of Soldiers' National Monument and marks the spot where President Abraham Lincoln delivered his celebrated Gettysburg Address. Today the battlefield has 30 miles of paved avenues and 1,425 monuments and markers in the 2,800-acre area of the National Military Park; the National Cemetery covers 17 acres.

The new Visitor Center at the park is just south of the town of Gettysburg, can be reached on either U.S. 15 or State Route 134, and is open every day except Thanksgiving, Christmas, and New Year's Day. Tourists may obtain information about the park and battlefield, and see free exhibits, including the notable painting of Pickett's Charge, "The Gettysburg Cyclorama," by Paul Philippoteaux. From the center, one may take a 1-hour walking tour which leads to the National Cemetery and Meade's Headquarters, and to the High Water Mark Monument, where, at the Copse of Trees and the Angle, Pickett's Charge was halted on July 3, 1863. A 2- to 3-hour auto tour covering the entire park originates from the Visitor Center parking area.

Three miles east of Gettysburg on State Route 116 is East Cavalry Field, site of the Union cavalry's interception and defeat of J. E. B. Stuart.

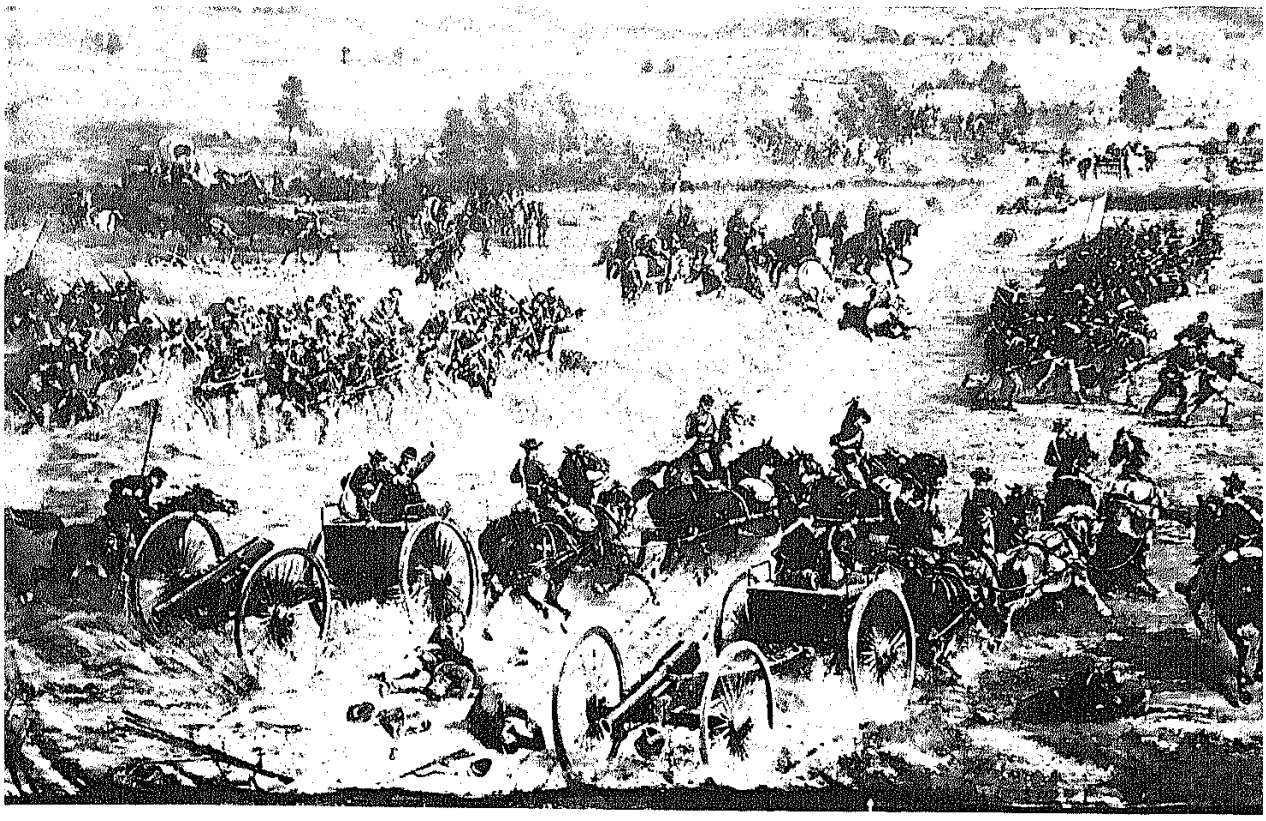
*Hopewell Village National Historic Site:* The buildings and restored furnace on this site form one of the oldest ironworks standing in the country today and represent the industrial enterprise of colonial and early America. The village's importance as a local supplier of iron products is indicated by the only surviving record book of its founder, Mark Bird. The records show that in 1784, 14 years after its creation, the furnace was producing pig iron for forges, stoves, kettles, pots, and similar country castings and forge hammers and other castings for industry. Bird served as a colonel in the militia and applied his energy and knowledge toward the production of badly needed supplies for Washington's army at Valley Forge.

Hopewell Furnace was part of America's early response to the need for iron. The depression of 1841 and the growth of city foundries forced Hopewell out of the stove business and into the charcoal business. Production continued sporadically until 1881. By then the furnace was merely an industrial relic, and in 1883 it was "blow'd out" for the last time. Hopewell Village, containing 848 acres, was established as a historic site in 1938. It is 5 miles south of Birdsboro, approached from the north by U.S. 422, State Route 82 to Birdsboro.

### *National Forest Recreation*

In the scenic northwest corner of Pennsylvania lies Allegheny National Forest, established by President Coolidge in 1923. The forest encompasses 712,977 acres, 471,081 of which are federally owned. Headquarters are at Warren.

The forest, situated on the Allegheny Plateau and entirely within the drainage system of the Upper Allegheny River, offers excellent trout



The Gettysburg Cyclorama is a panoramic painting of Pickett's Charge by Paul Philippoteaux.

and bass fishing and three swimming developments. Deep within the forest a magnificent stand of virgin hardwood and hemlock, the Tionesta Scenic Area, has been set aside for public use and enjoyment.

Another great attraction of the Allegheny National Forest is the abundant wildlife. Motorists driving over the scenic roads are almost certain to catch glimpses of deer, turkeys, rabbits, grouse, and other animals and birds. Hunting is permitted throughout the forest under State game regulations.

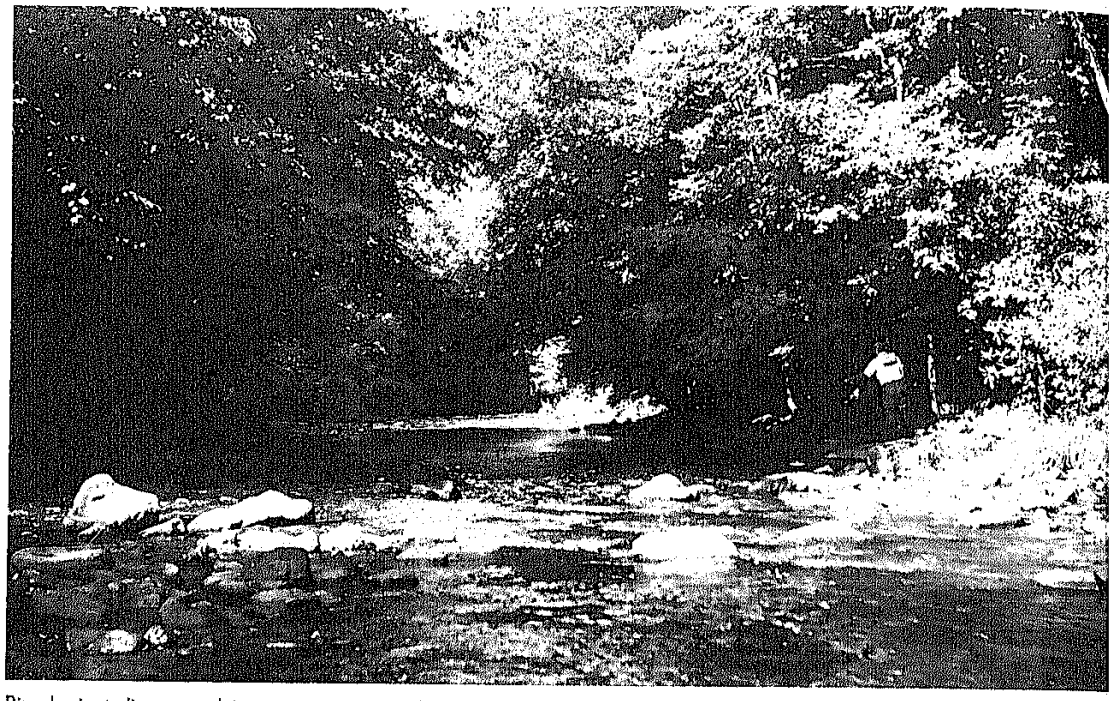
Hiking, trail riding, mountain and rock climbing, skiing, and snowshoeing are enjoyed by thousands of visitors. Recreation facilities include seven campgrounds, 11 picnic areas, and 22 roadside picnic tables.

### *Privately Owned Recreation Facilities*

Privately owned recreation facilities are of major importance in Pennsylvania. These vary from resident summer camps for boys and girls to farms operated as vacation spots. Hunting opportunities, often in combination with cabin facilities, are available as are privately owned camping, picnicking, fishing, hiking, and horseback riding facilities.

Skiing has become especially popular in Pennsylvania, and resort owners possess approximately $20 million worth of snowmaking equipment to supplement nature when necessary. Popular ski areas include Elk Mountain, near Carbondale in the northeast, Seven Springs, in Uniontown in the southwest, Blue Knob, near Gettysburg, and Camelback, adjoining Big Pocono State Park in Tannersville.

Lists of all the privately operated recreation opportunities in Pennsylvania are not available from any single source. Travel bureaus and agencies, commercial organizations such as gasoline companies, motel and hotel associations, airlines and railroads, local chambers of commerce, and outdoor clubs and organizations all supply information on many of the privately owned facilities. Local inquiry will reveal others. Information is available from the Bureau of Travel Development, Pennsylvania Department of Commerce, 129 South Office Building, Harrisburg, Pa. 17120.



River basin studies, research in removing impurities from coal, development of a beach area in a National Forest—all are activities of Federal natural resource agencies working to safeguard our natural heritage.

# Programs of Federal Natural Resource Agencies

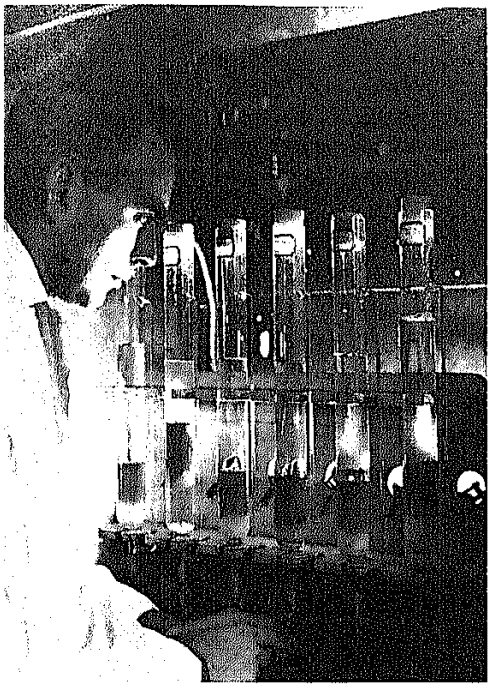
The natural resource functions of the Federal agencies represented in this booklet are extensive and detailed and are only briefly described. Additional information can be obtained by contacting the offices noted in the following programs section.

## U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers is responsible for the construction and operation of water resource development projects authorized by Congress for Pennsylvania. Such projects improve navigation, flood control, recreation, and domestic and industrial water supply. The Corps also undertakes planning for long-range development of water resources of entire river basins and geographic regions, in cooperation with other Federal and State agencies.

In 1965 the Corps had 164 projects or basin programs completed, under construction, authorized, or under study in Pennsylvania. Eleven big reservoirs (including four costing $40 million or more) had been completed; five more (including two, Allegheny Reservoir and Tocks Island Reservoir, in the hundred-million-dollar class) were under construction.

Twenty-six local-protection projects provided flood control for specific local areas, including Pittsburgh and its Golden Triangle, Bethlehem,



Allentown, Scranton, Johnstown, Sunbury, the Wyoming Valley, Uniontown, Butler, and Chester.

At least four Corps projects improve navigation in Pennsylvania. On the Delaware River, which forms the boundary between Pennsylvania and New Jersey, the Corps is providing a 40-foot-deep waterway that can carry oceanborne commerce from the sea past Philadelphia to Trenton, N.J. On the Ohio River, which carries some 90 million tons of commerce annually, the Corps is replacing an obsolete 51-dam canalization project with a modernized project consisting of 19 large locks and dams, three of which are in Pennsylvania. The Monongahela River waterway, with its heavy traffic in coal, is similarly being modernized; eight of its 15 locks and dams are in Pennsylvania. And on the Allegheny River the Corps has completed an eight-dam canalization system.

Philadelphia and its neighbor ports in the Delaware estuary, which together constitute one of the world's great concentrations of commerce, are improved and maintained by the Corps. The Great Lakes Port of Erie is similarly cared for.

The only beach and shore project currently underway by the Corps of Engineers in Pennsylvania is one at Presque Isle Peninsula, on Lake Erie. Behind the beach and the protection works provided by the Corps, the State is developing a park.

Five major regional or basin-wide planning endeavors by the Corps and associated agencies involve Pennsylvania. These are the river basin plans for the Potomac, Susquehanna, and Delaware River Basins; the North Atlantic Regional development plan; and the Northeastern United States Water Supply study. The latter two are aimed at alleviating, on both a short-range and a long-range basis, problems revealed by the droughts of the 1960's and at providing a water-resource base for the continued growth of the Nation's most populous and highly developed industrial and urban region.

The two biggest individual Corps of Engineers' projects in Pennsylvania are Allegheny and Tocks Island Reservoirs. Allegheny Dam, dedicated in 1966, is the key structure for controlling the Allegheny River—which in turn is one of the two source streams for the great Ohio River. Tocks Island Reservoir is similarly the

key structure in the interagency, inter-State development plan for the Delaware River Basin. Among other things, its 36-mile-long lake, set in the spectacular wooded mountain scenery of the historic Delaware Water Gap, will provide recreation for a region populated by some 45 million people. It will be administered by the National Park Service.

Further information on Corps of Engineers' projects in Pennsylvania may be obtained from the District Engineer, U.S. Army Engineer District, Philadelphia, Custom House, Second and Chestnut Streets, Philadelphia, Pa. 19106.

## Office of Coal Research

The Office of Coal Research (OCR) which was established to award contracts for research and development of more efficient coal utilization, has several contracts with Pennsylvania organizations. The Westinghouse Research Laboratory in Pittsburgh is developing a coal-energized fuel cell, and Bituminous Coal Research of Monroeville is conducting research on a method of making pipeline quality gas from coal. The Consolidation Coal Co. Research Laboratory, of Library, is developing an advanced method of manufacturing gasoline from coal, as well as a method of gasifying lignite. In Philadelphia, the Atlantic Richfield Co. is investigating the use of coal in the fluidized coking process, and the Franklin Institute is working on the development of a novel coal gas producer.

Under contract to the OCR, Dorr-Oliver, Inc., is attempting to develop methods for converting both burned and unburned anthracite-mine waste banks into high quality road base materials and other potentially valuable products. (The Commonwealth of Pennsylvania, which has been active in this research area, will pay one-quarter of the costs of the work performed.) Pennsylvania State University is working with OCR in an attempt to identify coal types and constituents which are best suited for conversion to liquids and gases, for use in sewage treatment, and for special products which are being developed under the OCR contract research program.

Further information may be obtained from the Director of Coal Research, Department of the Interior, Washington, D.C. 20240.

## Bureau of Commercial Fisheries

In 1927 the Department of the Interior's Bureau of Commercial Fisheries began its first fishery investigation on Lake Erie, Pennsylvania's most important source of commercially valuable fish. Studies were continued thereafter on an intermittent basis until a field station was set up at Sandusky, Ohio, in 1957. Since then a continuing program of fisheries research has been conducted to provide the information needed for more balanced and efficient use of the fishery resources of the lake. The Lake Erie Fish Management Committee and the Lake Erie Committee of the Great Lakes Fisheries Commission have served to coordinate research by Canadian Provincial, Bureau, and State Fish Commission biologists.

Changing conditions in the lake—related to pollution and long-range changes in water temperature—have resulted in great changes in fish populations. Popular market fish—cisco, whitefish, walleye, blue pike—have been drastically reduced; fish not generally sought by commercial fishermen have increased greatly in numbers. Because of these changes, some of the traditional fishing methods are no longer used to take the fish now abundant in Lake Erie—smelt, carp, sheepshead, yellow perch, and gizzard shad.

Because exploratory fishing operations by the Bureau of Commercial Fisheries in Lake Erie indicated that smelt are readily taken by otter trawls, the Bureau provided fishermen with technical assistance in changing from gill-net to otter-trawl fishing. As a result a new fishery for smelt developed in Lake Erie; and it is expected that many U.S. fishermen will soon commence trawling operations.

The Bureau of Commercial Fisheries assists the fishing industry in promoting the sale of its products. Marketing specialists work with industry groups in locating new market oppor-

tunities and in expanding traditional ones, both locally and nationally. Food cookery demonstrations are conducted by the Bureau's professional home economists and marketing specialists.

The Bureau of Commercial Fisheries, with the assistance of the American fishing industry, has developed voluntary grade standards for 15 fishery products sold throughout the country. The inspected fish products not only protect the buying public, but they assist the Pennsylvania fishing industry by helping maintain the buyers' confidence in its products.

Information on the Bureau of Commercial Fisheries may be obtained from the Regional Director, Bureau of Commercial Fisheries, 5 Research Drive, Ann Arbor, Mich. 48103.

## Federal Water Pollution Control Administration

The Department of the Interior's Federal Water Pollution Control Administration administers a variety of programs aimed at improving the quality of Pennsylvania's waters, where needed, and maintaining the high quality of State waters untouched by pollution. Because water pollution problems respect no political boundaries, these programs are conducted in close cooperation with other government agencies—Federal, State, and local.

### *Comprehensive Planning*

Long-range, comprehensive planning for water quality management is the number one requisite of water pollution control activities. Such programs are conducted by the FWPCA regionally or on a river-basin basis and are aimed at permitting the re-use of water resources many times over. They take into account all present and anticipated water uses, including waste disposal, and allow for economic and population expansion.

Four of the ten drainage basins for which the Federal Water Pollution Control Administration has undertaken comprehensive planning studies include areas in Pennsylvania. These are: the Delaware Estuary, the Chesapeake-Susquehanna, the Great Lakes, and the Ohio River Basins.

### *Grants*

Federal grants since 1957 have helped the Commonwealth government to finance its water pollution control programs. Even before the Federal grants, Pennsylvania led the Nation in its water pollution control appropriations. The money spent has now more than doubled and, with Federal grants of approximately $240,000 a year, the Commonwealth's water pollution control budget is now above $1.5 million a year—second only to that of its neighbor, New York.

Federal grants to municipalities have also served to increase substantially construction of municipal sewage treatment plants. With a minimum of Federal supervision, the Pennsylvania Sanitary Water Board administers these grant programs and establishes applicant priority. The State agency also routinely inspects the finished projects to insure proper maintenance. Many facilities financed in this way are now in use. When all now under construction are completed, they will be serving some 5 million Pennsylvanians and improving the water quality in more than 1,500 miles of streams.

### *Support for Research and Training*

Research into water pollution problems and training of personnel in the various water pollution control disciplines are supported at colleges, universities, and other institutions by FWPCA grants. In a typical recent year, 10 such grants, totaling over $230,000, were awarded in Pennsylvania. In addition, many Pennsylvania engineers, biologists, chemists, and others concerned with water pollution have participated in specialized training courses held by the FWPCA. Administration laboratories—particularly at the Robert A. Taft Sanitary Engineering Center in Cincinnati—serve Pennsylvania and other States in coping with pollution problems of an emergency or very serious nature.

### *Acid Mine Drainage*

Under its technical assistance programs the Federal Water Pollution Control Administration

has taken the lead in a series of cooperative projects to demonstrate methods of controlling pollution caused by acid mine drainage, a particularly severe problem in streams of Pennsylvania's coal mining areas. Three of the projects are in Pennsylvania, at or near the communities of Mocanaqua, Altoona, and Slippery Rock. Particular emphasis is placed on appropriate methods of reclaiming exposed strip mine areas. Results of the Pennsylvania demonstrations will he useful in the more than 20 States where acid mine drainage is contributing to stream pollution.

*Water Surveillance*

A water pollution surveillance system is maintained by the FWPCA to provide information on the quality of the Nation's interstate waters. Six of the system's 128 sampling stations are located in Pennsylvania. The surveillance system yields data on more than 40 physical, chemical, and biological water quality criteria for a variety of uses, from long-range planning programs to specific pollution control measures.

*Enforcement*

Federal law provides enforcement procedures under which the Government can take action to abate pollution. The authorization fully recognizes the basic principle of Federal-State-local cooperation. Three bodies of water important to Pennsylvania—the Monongahela and Mahoning Rivers and Lake Erie—have been subjects of past enforcement actions. Joining the Federal Water Pollution Control Administration as conferees in these actions were the Pennsylvania Sanitary Water Board and the water pollution control agencies of the neighboring States involved.

The Water Quality Act of 1965 added a new dimension to water pollution control—the establishment of water quality standards for interstate waters. The standards, to be set by the States—or by the Federal Government upon a State's failure to do so—went into operation on July 1, 1967, and are enforced by the FWPCA. The setting of water quality standards marks a shift in emphasis to prevention of pollution before it occurs, rather than abatement after the damage is done. Where abatement of pollution remains necessary, however, the standards will provide goals for abatement measures.

All Federal establishments are required by law to cooperate in the prevention and control of water pollution. A recent survey revealed hundreds of instances of waste discharge from Federal installations into Pennsylvania waters, and the FWPCA, under authority of Executive Order 11288, Prevention, Control, and Abatement of Water Pollution by Federal Activities, has assumed the leadership in carrying out a program of abatement and control where such discharges contribute to pollution.

Records of public water supply and waste treatment facilities and needs, bond issues to finance these public works, and contracts awarded for their construction are collected and periodically published. In addition, the Pennsylvania Fish Commission and other State fish and game agencies report fish kills caused by pollution to the Federal Water Pollution Control Administration which annually compiles this information.

Because the FWPCA conducts its programs through regions determined by principal river and lake basins and not by political boundaries, Pennsylvania is responsive to three FWPCA regional offices, depending on the part of the State involved. These offices are: Northeast Regional Office, Federal Water Pollution Control Administration, 14th Floor, John F. Kennedy Federal Building, Boston, Mass. 02203; Middle Atlantic Regional Office, Federal Water Pollution Control Administration, 300 West Main Street, Charlottesville, Va. 22901; Ohio Basin Regional Office, Federal Water Pollution Control Administration, Room 7405, Federal Office Building, 500 Main Street, Cincinnati, Ohio 45202.

## U.S. Forest Service

The Forest Service of the U.S. Department of Agriculture conducts many programs in Pennsylvania that benefit the State's vast forest resources. This work ranges from management of the Allegheny National Forest to technical

assistance projects and basic research in silviculture.

A Forest Supervisor with headquarters at Warren administers the 712,977-acre Allegheny National Forest, which was established by President Coolidge in direct response to needs of the State. Wholesale removal of timber in the region during the 19th century led to serious erosion and flooding, and the Forest now protects vast watershed areas from these problems. The Forest is also managed to yield timber, provide wildlife habitats, and supply recreational opportunities for great numbers of people.

Future demands on the Forest for all these purposes are expected to intensify greatly. To meet anticipated needs, the Forest Service has drawn up long-range plans calling for such measures as planting 6,700 acres of timber; construction of 430 campgrounds, picnic areas, and related facilities; improvement of game ranges on 11,000 acres; development of 40 wildlife watering stations; construction of 241 miles of roads and 45 miles of trails; rehabilitation of eroded land; and establishment of new firebreaks.

*Research*

The Northeast Forest Experiment Station, a major research facility of the Forest Service, is located at Upper Darby. Research on better ways to fight forest fires is underway here, with emphasis on devising methods especially suited to the climate and wood types of the Northeastern States. Experts at the Station are also making general studies of Northeastern tree species and types.

At a smaller research center in Warren, studies are underway on the silviculture of Allegheny-region hardwoods and ways of protecting these trees from animal damage. The use of forests for recreational purposes and as wildlife habitat is also studied there.

A special project on reclamation of land damaged by mining is conducted from Kingston by the Forest Service. Research is performed on subjects including encouraging the growth of plants on mine waste piles and prevention of erosion and stream pollution. The ultimate aim is the conversion of land damaged by mining to useful purposes such as public recreation, timber production, and wildlife habitat. Much of the work is conducted in cooperation with mining firms.

*Technical Assistance Programs*

Forest Service experts work with the Pennsylvania State Forester and the Secretary of the State Department of Forests and Waters in several cooperative programs aimed at improved management of State and private forest lands. These ventures, including projects on watershed protection, tree planting, and forest pest control, are administered by State officials with technical and financial assistance from the Forest Service. In addition, the Forest Service helps in controlling fires on State and private forest lands in Pennsylvania. In a recent year assistance in fighting 1,769 such fires, involving over 14,000 acres, was given.

**For further information on Forest Service research activities in Pennsylvania, write: Northeastern Forest Experiment Station, 6816 Market Street, Upper Darby, Pa. 19082. For information about Forest Service State and private forestry activities in Pennsylvania, write: Northeastern Area, S&PF, 6816 Market Street, Upper Darby, Pa. 19082. General information on Forest Service programs and activities in the State is available from: U.S. Forest Service (Eastern Regional Office), 710 North Sixth Street, Milwaukee, Wis. 53203.**

## Geological Survey

Scientists of the Geological Survey are conducting several geologic and geophysical studies in Pennsylvania to increase knowledge of the earth's composition, structure, history, and mineral resources.

A basic product of the geologist's studies is a geologic map, which uses line or color patterns and various symbols to show what kinds of rocks are exposed at the surface and the probable shapes and structures of the various rocks below. Detailed geologic maps have

been made of several parts of Bucks, Lycoming, Clinton, Lehigh, Northampton, and Monroe Counties, with special emphasis on the complex stratigraphic and structural history of the Appalachian Mountains.

The Geological Survey also conducts research in economic geology—the geology of mineral and mineral-fuel resources—in order to determine areas in known mining districts where there may be additional mineral deposits; to locate new deposits; and to develop new tools and methods of exploration. Investigatinns directly related to economic geology include study of clay deposits throughout the State and analysis of coal fields in Schuylkill, Columbia, Northumberland, Carbon, Dauphin, Luzerne, Greene, and Washington Counties.

*Water Resources Investigations*

The Survey makes intensive studies of Pennsylvania's water resources to determine their location, quantity, and quality. Much of the work is done in cooperation with State agencies.

The program includes two principal types of work: (1) Continuing collection and publication of water data at stations that cover the State, and (2) research and reports on specific problems or areas that may range in size from a small valley to the entire State.

Streamflow records are being collected at 204 continuous gaging stations located throughout the State. In this network, 66 primary stations provide long term hydrologic records; 62 secondary stations will be operated for a few years to obtain records adequate for general hydrologic purposes; and the remaining 76 stations serve in the operation of specific water-management projects in Pennsylvania.

Water quality is measured at 75 river stations in the State. Ground-water levels are measured in a basic network of 46 wells to demonstrate changes in underground storage. In addition, water levels are measured in many other wells and many samples of water are collected for analysis in connection with project investigations.

Studies of stream pollution by chemicals and sediments, together with water temperature measurements, are essential to the program in Pennsylvania where the extensive mining and industrial activities have often used streams to dispose of wastes or to cool equipment. Quality-of-water data, when analyzed and interpreted, is the basis for effective measures to combat pollution of all types. Special emphasis is being given to salinity in relation to tidal fluctuation of the Delaware River, and to general quality problems of the Ohio River, Schuylkill River Basin, Lehigh River Basin, Conestoga Creek watershed, Bixler Run watershed, and the Corey Creek and Elk Run watersheds.

Two special studies of statewide interest relate to: (1) Peak flood-flow characteristics of small streams, with data being obtained at 41 crest-stage stations; and (2) low-flow measurements, with data being obtained at 98 partial-record stations and at many other base-flow observation points. The results of these studies will greatly extend the usefulness of the data from the regular networks.

Investigations and reports on total water resources are underway for the Schuylkill River Basin and Lehigh County. Investigations and reports on the geology and ground water resources are underway on the Wyoming Valley in Luzerne County; the Martinsburg shale in central Dauphin County; New Oxford Formation in Lancaster County; carbonate rocks of the Lancaster quadrangle; the metamorphic and igneous rocks of central Chester County; the Martinsburg shale in Northampton and Lehigh Counties, the Mifflintown, Shenango, and Stoneboro quadrangles. Investigations of the ground water resources and sediment characteristics of the Susquehanna River Basin are being conducted as part of the comprehensive study of the water and related land resources of the basin.

*Topographic Mapping*

The value of topographic surveys and maps for geologic exploration and development of Pennsylvania's rich natural resources was recognized as early as 1884 when the first maps of the Commonwealth were published.

Published maps in the scale of 1:62,500 and in the 1:250,000-scale series are available for the entire State, and in the scale of 1:24,000 (more

detailed) for 63 percent of the State. A State map at 1:500,000 scale is available in several forms.

Pennsylvania has participated in cooperative mapping programs with the Geological Survey for most of the century. In 1962, recognizing that areas subject to considerable urban, industrial, or agricultural development require specialized, larger-scale, modern maps, Pennsylvania embarked on a 10-year cooperative mapping program which provides for complete coverage of the State with maps of the 1:24,000-scale series.

A total of 13,180 square miles of mapping is now in progress in Pennsylvania. The mapping of 10,865 square miles of this area is financed by a cooperative program with the Bureau of Topographic and Geologic Survey, Department of Internal Affairs, on a 50–50 basis. The remainder of the mapping program is financed with Federal funds.

Further information on water resources investigations in Pennsylvania can be obtained from the District Chief, Water Resources Division, U.S. Geological Survey, U.S. Custom House, Second and Chestnut Streets, Philadelphia, Pa. 19106. General information on the activities of the Geological Survey in Pennsylvania is available from the Geological Survey, Department of the Interior, Washington, D.C. 20240.

## Bureau of Mines

Pennsylvania, located in the middle of America's greatest mining and industrial complex, serves as the largest center of activity for the Department of the Interior's Bureau of Mines. Bureau scientists, engineers, technicians, and supporting personnel staff four major research centers and laboratories in Pennsylvania, three health and safety offices, an area center for mineral resource studies, and the Bureau's field administrative headquarters for the entire Eastern United States. In the Pittsburgh area alone, the Bureau employs more people than it does in its Washington, D.C., headquarters.

Many programs underway at Bureau installations in Pennsylvania are directed toward conservation and development of the abundant mineral resources of the Keystone State. But the results of Bureau research and investigations conducted here also benefit other parts of the Nation. Bureau scientists are working toward better ways of mining, processing, and using Pennsylvania's metals, nonmetals, and mineral fuels. Health and safety research by the Bureau has helped to reduce hazards faced by miners. Important programs also are underway, in cooperation with the State government, to protect Pennsylvania's unused coal resources from accidental loss through fire and flooding.

### *Coal*

Coal is Pennsylvania's single most important resource, and major Bureau programs in the State are concerned with this mineral fuel. Much of this work is done at the Pittsburgh Coal Research Center, the largest facility in the Nation for investigating the technology of bituminous coal.

Scientists at the Center are determining the preparation and carbonization characteristics of Pennsylvania's bituminous coal. Currently, they are engaged in studies to find out how coal from various deposits in the State responds to simple washing methods designed to reduce sulfur and ash content. Cleaner coal not only burns more efficiently, it also contributes less to air pollution. In another promising approach to air pollution reduction, the Bureau operates a pilot plant at the Center to test a method, invented by Bureau researchers, for removing sulfur dioxide from gases generated when coal is burned.

A second general area of research at the Pittsburgh Center is aimed at making more effective use of coal in conventional applications. For example, electric power generation is an important use of bituminous coal, and the Bureau works to expand this market through research to improve coal's combustion efficiency. In addition, by carefully studying the mechanics of the coking process, Bureau scientists are trying to find ways in which more of the coal mined in Pennsylvania can be used for making coke. Improvements in the use of coke and other fuels in producing iron have been derived

from recently concluded research with the Center's experimental blast furnace.

Perhaps the most forward-looking research on coal conducted at the Pittsburgh Center is aimed at developing new uses and markets for this versatile substance. Studies are underway on methods for converting coal to gaseous and liquid fuels that can be carried by pipeline and used to run internal combustion engines. Another project is designed to develop a commercially feasible method for direct conversion of coal to electricity by a complex process called magnetohydrodynamics.

These and other applied research efforts are supplemented by fundamental studies of coal's structure, composition, and characteristics, which provide basic information without which practical research cannot succeed.

In the anthracite region of eastern Pennsylvania, the Bureau carries on a program to control fires in abandoned mines and inactive coal deposits, which not only destroy valuable coal resources but also menace nearby communities. Also, in cooperation with the State government, the Bureau has helped to control water that seeps into underground workings in the anthracite field from flooding valuable coal reserves. Recently, the U.S. Congress authorized an extension of this mine-water control program to provide for the filling and sealing of abandoned mines that imperil public health and safety.

### *Petroleum*

Petroleum is also important to Pennsylvania's economy and the Bureau of Mines works toward full development and use of the State's petroleum and natural gas resources through research performed at the nearby Morgantown (W. Va.) Petroleum Research Center.

Bureau researchers try to ascertain whether certain new recovery techniques should be used in Pennsylvania. Basic knowledge about conditions in oil reservoirs is obtained and fed into computers; predictions concerning the amount of oil that can be recovered by a particular method are made. This information is made available to local petroleum producers so they may profitably develop their properties and thereby add to the Nation's supply of this essential fuel.

### *Health and Safety*

Research that benefits mine operators and workers throughout the world is conducted at the Bureau's Health and Safety Research and Testing Center in Pittsburgh. This Center also serves manufacturers of mining equipment, who voluntarily submit prototypes of many different kinds of machinery and accessories to the Bureau, which tests them to determine their safety for use underground. New respiratory devices are tested here in a specially designed chamber that simulates underground conditions. Bureau research includes detailed studies of mine-ventilation systems and investigations to develop improved methods for supporting mine roofs and for fighting mine fires.

Day-to-day efforts to promote safety in Pennsylvania's coal mines are the province of the Bureau's coal mine inspectors. Besides spending a great deal of time underground looking for the many different kinds of hazards that might exist in underground mine workings, these men conduct first-aid classes, attend safety meetings, and in other ways promote safe, healthful mining conditions and practices. The Bureau recently acquired a "classroom on wheels"—a large bus equipped with teaching aids to explain the proper use of fire-resistant hydraulic fluids. Eventually the bus will carry its message to every coal mining State in the Nation.

One special area of mining safety is the concern of the Pittsburgh Explosives Research Center, where scientists perform basic studies of combustion and explosion phenomena, work to make coal-mining explosives and related devices such as detonators safer, and test new explosives to determine whether they can be approved as "permissible" for use in underground coal mines. Samples of explosives awarded the Bureau's seal of permissibility are periodically collected in the field and rechecked.

Important to the Center is the Bureau's famous experimental coal mine at Bruceton, near Pitts-

burgh. It was here that the Bureau many years ago conducted the first American demonstrations to prove that coal dust mixed with air is explosive; and spectacular proof of this long-unaccepted fact is still provided in demonstrations held at Bruceton. The coal dust hazard remains an important concern of the Explosives Research Center, where scientists are studying the interaction between coal dust and methane, the explosive gas often released from coal seams during mining.

Many other programs at the Center have special significance for Pennsylvania's mining industry, including investigations of misfires in blasting operations, and research designed to achieve the greatest safety possible in handling and use of the ammonium nitrate-fuel oil mixtures that have become so popular in recent years as inexpensive blasting agents. The Bureau's explosives experts are now recognized as America's foremost civilian experts on explosives. As a result they are often asked to undertake specialized work for other Government agencies, including the military services.

*Mineral-Resource Studies*

Many phases of Pennsylvania's mineral economy are under study at the Bureau's Mineral Resource Office in Pittsburgh. This office is now cooperating with the State government in an investigation of the economic potential of Pennsylvania's abundant clay deposits. A study of economic and technological structure of the iron and steel scrap industry also in underway to provide basic data needed by the State's steel producers.

Mining experts from the Mineral Resource Office study mining methods and costs at many of Pennsylvania's mines and quarries, supplying operating data that can be used by the entire industry.

In many different ways, the Bureau of Mines promotes the wise development and use of the Keystone State's varied mineral commodities and helps safeguard the lives and health of the thousands who extract and process its mineral wealth. By carrying on forward-looking research and investigations, and by making the knowledge it obtains widely available, the Bureau works to conserve mineral resources and the most precious resource of all, human life.

**Further information on the activities of the Bureau of Mines in Pennsylvania is available from the Area Director, Area I, Mineral Resources Office, Bureau of Mines, 4800 Forbes Avenue, Pittsburgh, Pa. 15213.**

## National Park Service

The National Park Service administers Independence National Historical Park, Carpenters' Hall, Fort Necessity National Battlefield, Gettysburg National Military Park and Cemetery, and Hopewell Village National Historic Site. These areas are discussed in the section of this booklet entitled "Outdoor Recreation."

In addition, three areas in Pennsylvania have been authorized by Congress for inclusion in the National Park System. Plans for developing these areas—Allegheny Portage Railroad National Historic Site, Delaware Water Gap National Recreation Area, and Johnstown Flood National Memorial—are being prepared.

The Allegheny Portage Railroad was a segment of the Pennsylvania Canal that linked Philadelphia with Pittsburgh. The railroad connected the eastern division and the western division of the canal, crossing the main ridge of the Allegheny Mountains between Hollidaysburg and Johnstown. It was built between 1831 and 1834 and was a combination level-track and inclined-plane railway. Five inclined planes using cables powered by stationary engines were used to haul the barges up the nearly 1,400-foot rise from Hollidaysburg west to the Allegheny Summit at Blair's Gap. Five additional inclined planes and a 901-foot tunnel permitted the barges on the railroad to be lowered down the nearly 1,200-foot drop from the Summit to Johnstown.

The inclined planes and level tracks at the historic site, the most outstanding engineering accomplishment in the American canal-building era, are the best preserved and most dramatic view of the Portage Railroad route.

A second National Park Service area in the State will commemorate the tragic Johnstown

flood of 1889. The area is site of the ill-fated South Fork Dam which was started in 1836 to provide a feeder reservoir for the western division of the Pennsylvania Canal.

The 850-foot-long earth and stone dam, abandoned as a canal facility in 1862, was later repaired and raised in height to 100 feet by a sportsmen's club that developed the reservoir for fishing. The dam burst on May 31, 1889, following unprecedented rains.

A wall of water, estimated by some to have been 50 feet high, rushed down the Little Conemaugh Gorge to engulf Johnstown. The heart of this industrial city was swept away. Between 2,000 and 3,000 persons lost their lives while property damage was estimated at more than $12 million.

Delaware Water Gap National Recreation Area will be the first national recreation area east of the Mississippi River. The 72,000-acre site partially surrounds the reservoir under construction by the Corps of Engineers at Tocks Island, near Stroudsburg.

The National Park Service plans to provide day-use and overnight camping facilities. Boating, swimming, fishing, and water skiing will be possible. Access routes are being planned to avoid concentration of traffic.

An interpretive program is planned to inform the visitor about the area and its scenic, historical, and recreational values.

Further information may be obtained from the Northeast Regional Office, National Park Service, 143 South Third Street, Philadelphia, Pa. 19106.

## Bureau of Outdoor Recreation

While the Bureau of Outdoor Recreation of the Department of the Interior manages no land, its functions are of significance to the citizens of Pennsylvania and to visitors to the State.

The Bureau provides technical services and planning and survey assistance to State and local governments. It also assists in preparation of standards for statewide recreation plans and, upon authorization by the Congress, will administer Federal financial grants-in-aid for State recreation planning and recreation land acquisition and development.

The Bureau, created by Presidential order and established in the Department of the Interior in the spring of 1962, correlates related outdoor recreation programs of the various Federal agencies and bureaus operating in the State; is responsible for formulating a nationwide outdoor recreation policy and plan based on State, regional, and Federal plans; sponsors and conducts recreational research; and encourages interstate and regional cooperation in outdoor projects. It also works on other projects assigned by the Secretary of the Interior and by the President's Recreation Advisory Council.

Further information may be obtained from the Bureau of Outdoor Recreation, Northeast Region, 128 North Broad Street, Philadelphia, Pa. 19102.

## Soil Conservation Service

In Pennsylvania the Soil Conservation Service of the U.S. Department of Agriculture assists in the development and conservation of both soil and water resources. Technical assistance is usually channeled through soil and water conservation districts which are locally organized and operated under State law.

SCS gives on-site help to soil and water conservation district cooperators in developing and applying individual conservation plans for protection and improvement of land. Such plans are based on soil surveys that assist the landowner in determining proper land use and needed conservation treatment.

The Watershed Protection and Flood Prevention Act, Public Law 566, authorizes SCS to give technical and financial assistance to local sponsors of small watershed projects designed to reduce flood damage, soil erosion and sedimentation, and to provide water for irrigation, public

recreation, and municipal and industrial uses. The projects are initiated, built, and operated by local people.

The SCS's National Cooperative Soil Survey is conducted in the State in cooperation with the Pennsylvania State University. Also, the State Soil and Water Conservation Commission and the Department of Highways contribute funds and facilities to assist the Soil Conservation Service in soil mapping, sampling, characterization work, and in publishing reports on the results of these projects.

Finally, the SCS is participating in development of a comprehensive water and related land resource plan for the Susquehanna River Basin in Pennsylvania, Maryland, and New York.

Additional information may be obtained from the Soil Conservation Service State Office, 100 North Cameron Street, Harrisburg, Pa. 17101.

## Bureau of Sport Fisheries and Wildlife

Whenever federally sponsored water developments are planned, the Bureau of Sport Fisheries and Wildlife studies the effects such development will have on the fish and wildlife resources of the area. In Pennsylvania the Bureau conducts investigations of the Delaware, Susquehanna, Potomac, and Kanawha River Basins, as well as investigations of small watershed or hydroelectric developments under Federal permits. From these studies come suggestions of ways in which the project planners can protect and benefit the area's fish and wildlife resources.

A great deal of interest has been shown recently in the fishery potential of the Susquehanna River. The Bureau and other Federal agencies, in cooperation with the State Fish Commission and five power companies, are studying the feasibility of restoring fish runs in the Susquehanna. This stream formerly supported great runs of shad and other migratory fish, but these runs have declined in recent years because of pollution, obstacles posed by power dams, and other problems in the Susquehanna basin. The study is seeking the answer to whether the river can support a run of shad if adequate fishways are installed at the dams in the lower part of the Susquehanna.

The State's only national wildlife refuge, the Erie Refuge, is located about 25 miles from the shores of Lake Erie, in northwestern Pennsylvania. It is destined to become an important link in the national chain of waterfowl refuges. Under full operation (it still lacks some acreage needed to reach its full potential) it should be an important resting and feeding area for thousands of ducks and geese traveling the Atlantic Flyway between breeding and wintering grounds. It is anticipated that the refuge will eventually harbor some 25,000 geese, largely Canadas, and 75,000 ducks, including mallards, black ducks, blue-winged and green-winged teal, baldpates, and wood ducks, as well as the endangered redhead and canvasback. The refuge marshes are expected to raise hundreds of young mallards and black ducks.

Other migratory game birds, such as woodcock and mourning dove, are found on the refuge in good numbers, especially in summer; many shorebirds and songbirds stop off here on their migrations as well. Management of the refuge is also being directed toward increasing the numbers of upland game birds, such as the bobwhite quail, ruffed grouse, and ring-necked pheasant. Wild turkey is being stocked in an effort to restore this native bird to the area.

Two national fish hatcheries are located in Pennsylvania. At Lamar, both trout and warmwater species are produced; at Clarendon, trout are raised. Another unit of the Lamar hatchery, under construction at nearby Tylersville, will add tremendously to the production capacity of the station.

Through its fishery management program the Bureau of Sport Fisheries and Wildlife provides technical assistance for improvement of sport fishing at several military installations in the State and plans a stocking program for the waters of the Allegheny National Forest.

The Bureau and the U.S. Forest Service are conducting cooperative studies in wildlife-forest relationships in the Allegheny National Forest. The research is aimed at increasing the production of trees in the forest, to benefit both forest production and the region's wildlife.

Pennsylvania is an active participant in the Bureau of Sport Fisheries and Wildlife Federal Aid programs. In a recent year, nearly $900,000 of these funds, matched by the State, was used to obtain and develop State game lands and to acquire and improve State fishing waters.

The Bureau has established two groups at Pennsylvania State University to conduct research aimed at discovering basic information that will assist the State Fish and Game Commissions in managing resources. Also of importance will be the workers trained by these units to fill the increasing number of research and management positions in fish and wildlife conservation.

Other Bureau activities in Pennsylvania include a cooperative program with State agencies and farm groups to control predatory animals, rodents, and birds that cause damage to livestock, agricultural crops, and timber stands.

Two Game Management Agents are stationed in Pennsylvania. While their chief responsibility is enforcing Federal regulations relating to fish and wildlife resources, they also direct the trapping and banding of migratory waterfowl and the periodic inventories made of these birds.

Further information on the activities of the Bureau of Sport Fisheries and Wildlife is Available from the Regional Director, Bureau of Sport Fisheries and Wildlife, U.S. Post Office and Courthouse, Boston, Mass. 02109.

## Office of Water Resources Research

The Water Resources Research Act of 1964 (Public Law 88-379 as amended by Public Law 89-404, April 1966) is administered by the Office of Water Resources Research (OWRR). It is one of the newest of the Federal-State programs dealing with natural resources. Focal point in this program is an approved water resources research center or institute in each State and Puerto Rico.

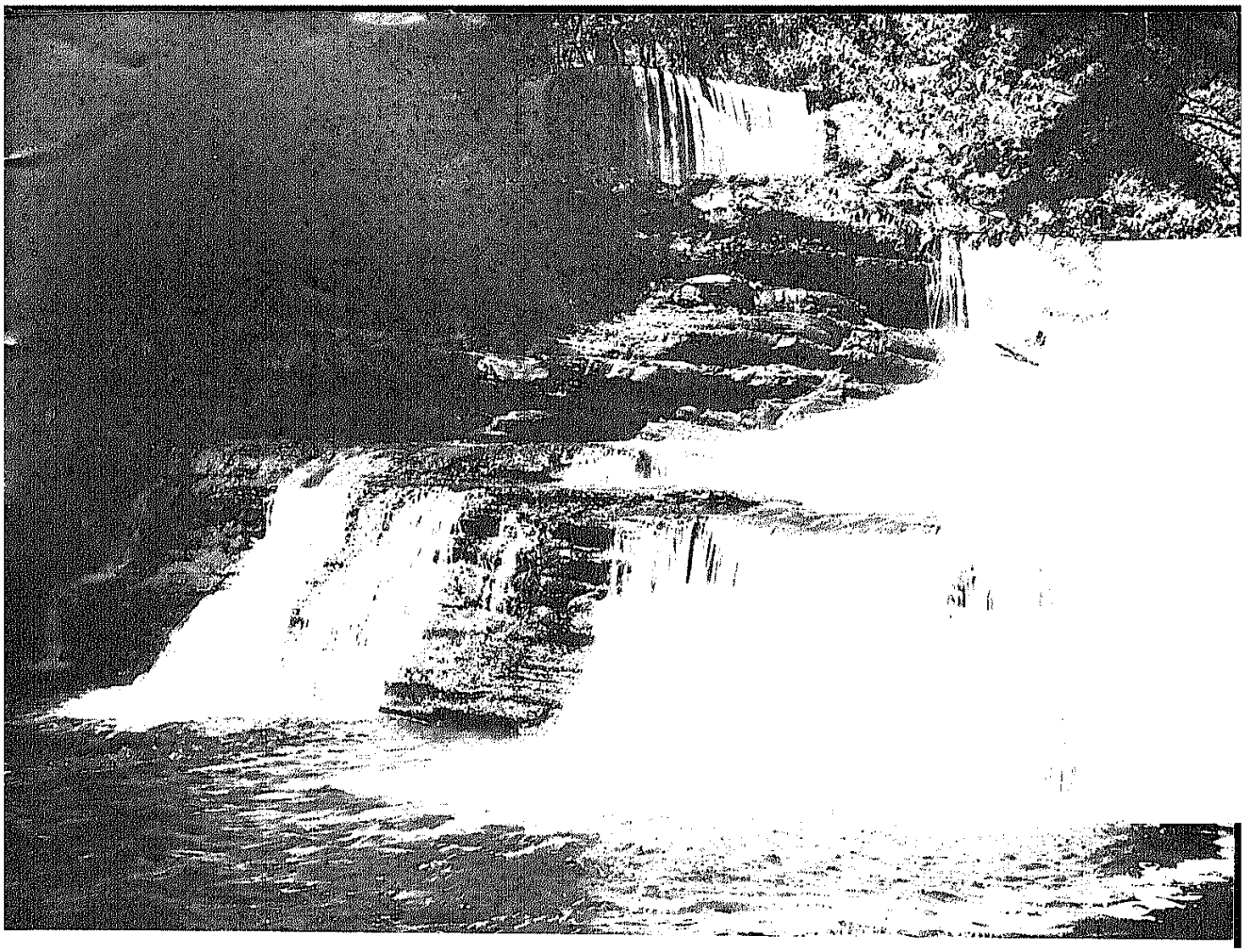
The institute at Pennsylvania State University is one of these 51 centers that receives annual allotments from OWRR to promote research and training in the water resources field. Funds for matching grants for the support of specific research projects submitted by these centers are available on a competitive basis. The act also authorizes appropriation of Federal funds through matching grants, or other arrangements, to public agencies, institutions, private industry, or individuals for research on selected water problems related to the mission of the Department of the Interior.

The Pennsylvania institute is conducting research on problems and means of ameliorating problems arising from acid mine drainage and other forms of pollution, water resources economics, methods of integrating storm-water planning for multiple land use in urban and suburban developments, and other water resource problems of importance, both at the State level and regionally or nationally. The institute maintains close contacts with colleges and universities within the State having competence in water resources research and training and keeps advised on local and State water resources research needs.

In addition to the projects carried on at the institute at Penn State, three of the first 31 title II proposals approved under the act were submitted by Pennsylvania investigators—one by the Carnegie Institute of Technology on systems engineering planning; one by the University of Pittsburgh on flow prediction for water resources planning; and one by a private company, Cyrus William Rice & Company, on the economic value of water in industrial use. Thus, good progress has been made in enlisting the competence of Pennsylvania researchers in helping solve some of the State's water problems. Additional projects responsive to State needs will be added when others are terminated or as funding permits.

Students who are employed as research assistants to the well-qualified principal investigators conducting approved projects receive valuable training while performing useful research. Thus there are two primary products of this program—research results and trained personnel.

Additional information on the activities of the Office of Water Resources Research pertaining to Pennsylvania may be obtained from the Director, Institute for Research on Land and Water Resources, the Pennsylvania State University, University Park, Pa. 16802.



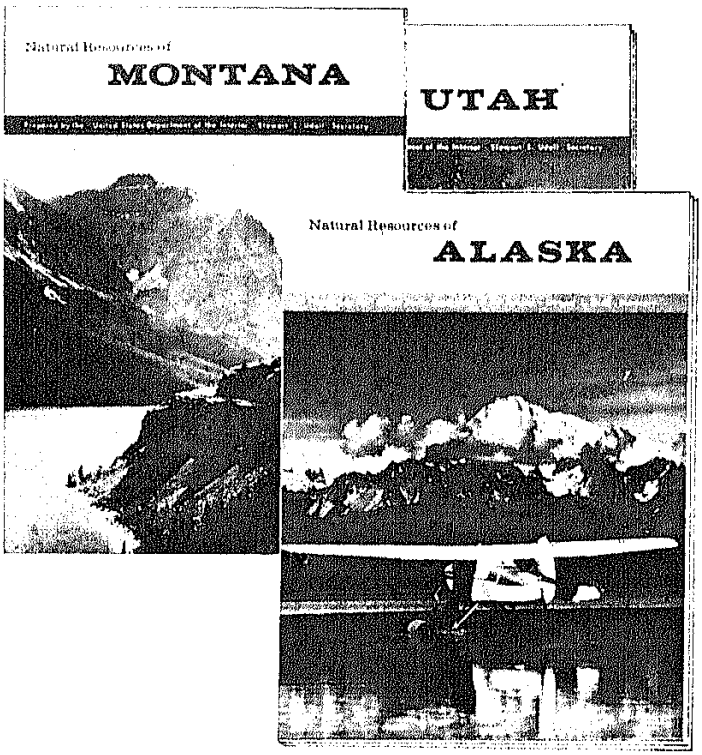
## The Future

"The things that truly last, when men
and time have passed,
They are all in Pennsylvania this
morning."

Rudyard Kipling paid tribute to Pennsylvania with these lines. It was here that William Penn laid the foundations of an experiment in government that proved a well-spring of modern democracy; in Pennsylvania the Indians lived in peace with European settlers; no exiling of religious dissenters, no witch burning, no barriers of race, religion, politics, or class hindered the development of security, freedom, and happiness here.

Today the people of the Commonwealth enjoy that priceless heritage and are living witnesses to the fulfillment of those concepts and ideals. In more than name Pennsylvania has been the Keystone of the Union. Its contributions to the Nation have been—and continue to be—immense.

Not the least of these contributions are those that the State has made as a part of the conservation movement. In helping to conserve and improve its precious natural resources of soil, water, minerals, and wildlife, and in the resourcefulness of its citizens, Pennsylvania has played a leading role in the greatest success story of our day. The Federal Government and the Commonwealth of Pennsylvania will continue to work together to insure a future as bountiful as the past.

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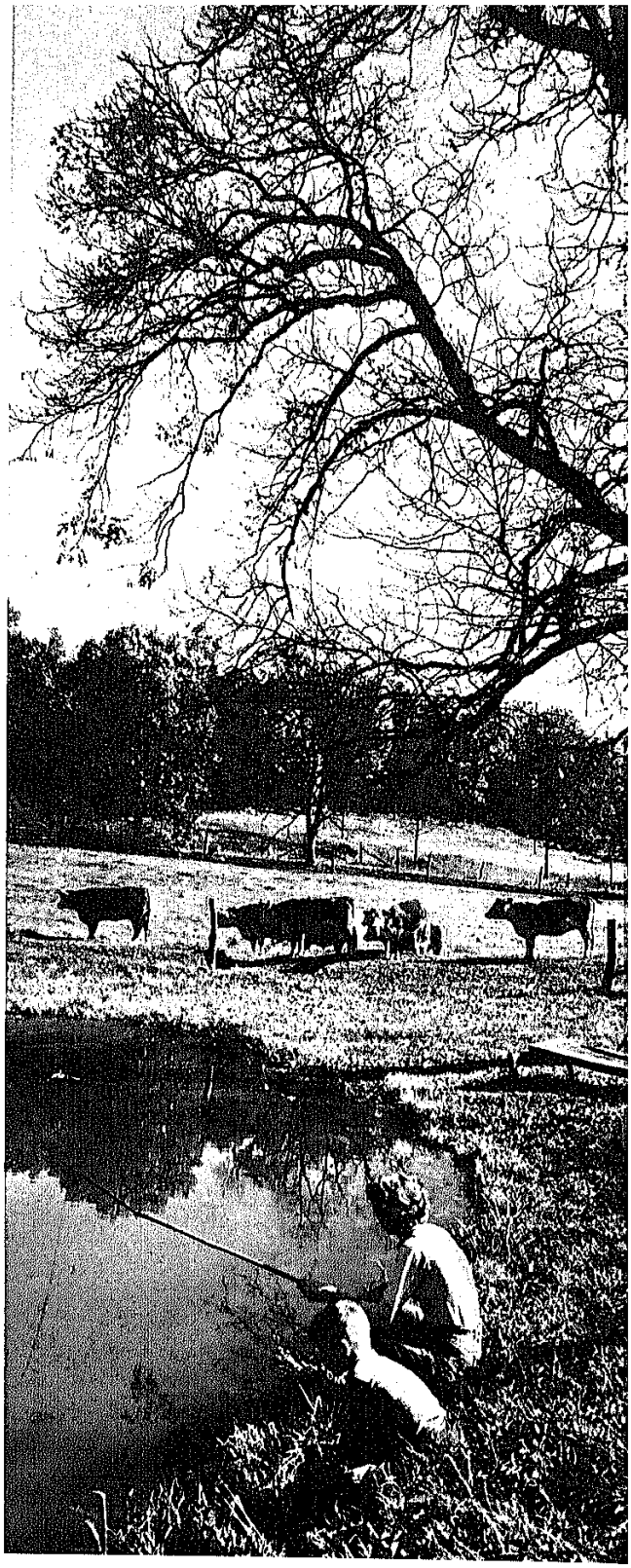

Created in 1849, the Department of the Interior—a Department of Conservation—is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States—now and in the future.


## Acknowledgments

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